Linecasting Operator-Machinist

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Operator - Machinist

THIS BOOK is the answer to a long felt need of the operator-machinist who is faced with a deadline, and the many problems he encounters; the solution of which is imperative to keeping his machine "on the road." It reads easily and the machinist will find it simple to locate any situation for which he is seeking an immediate correction.

The authors have had years of linecasting experience. They both have unusual talents in encompassing the complete range of problems and they explain and solve them in a free, informal and entirely engaging style.

They have had years of experience; operating, repairing, teaching, and consulting with top specialists in linecasting equipment. They know and understand the problems of the very small and the largest shops throughout the country. They have met countless emergency situations and remedied them, eliminating waste and loss of time. This is their reason for trying to help any and all operators, machinists, and foremen of linecasting equipment.

STOCKTON BOOK PUBLISHERS
PITTSBURGH, PENNSYLVANIA

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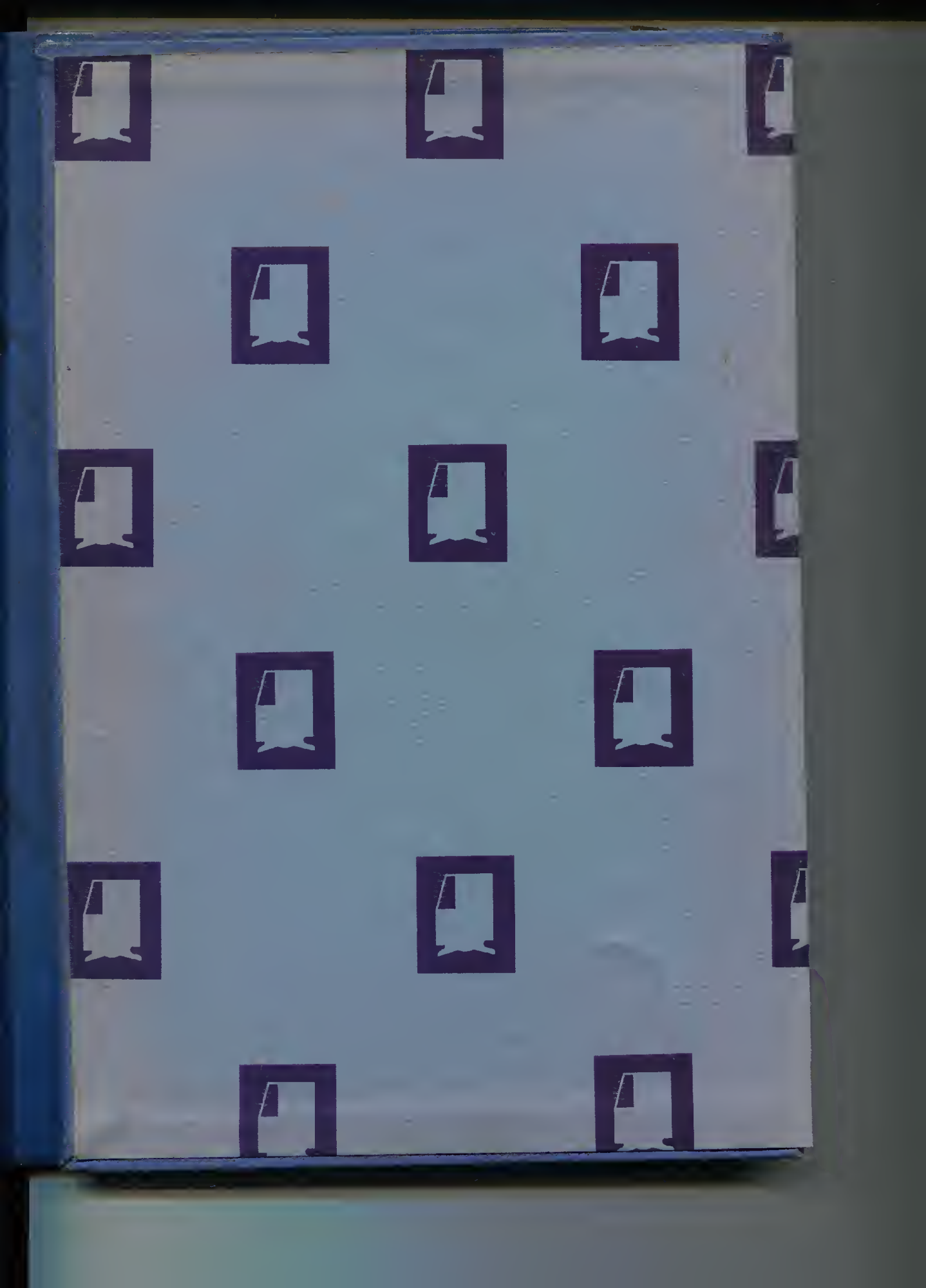

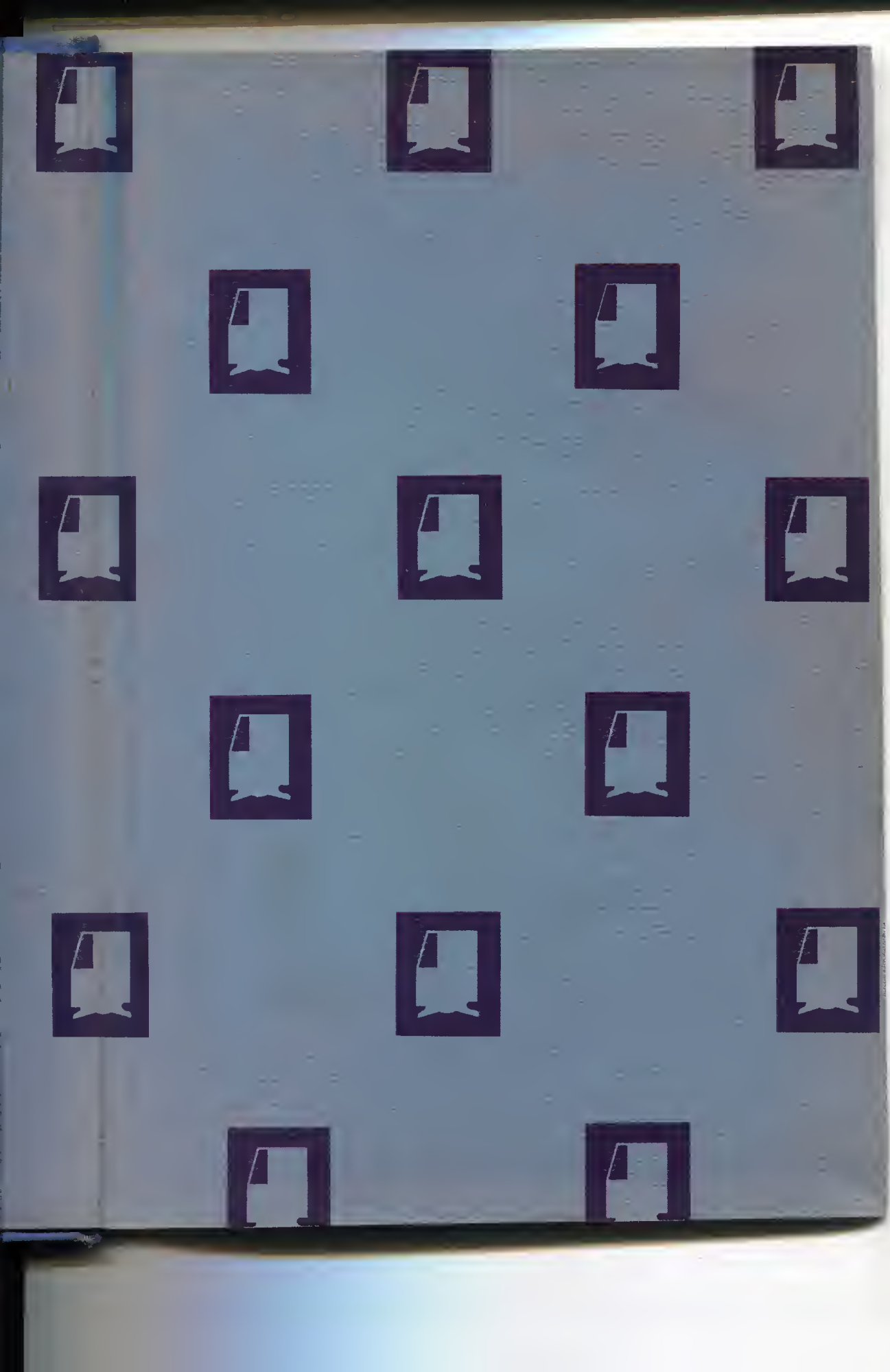

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LINECASTING OPERATOR-MACHINIST

TO JOHN WAGOUN,

dean of those jewel-like individuals, the conscientious free-lance linecasting machinists. John's ending was sad and a little inglorious, but his life must have been rich and full with the satisfaction derived from intelligent and uncompromising work on his beloved *mah'-sheen.*

For the many who still inquire, John was born in Bohemia, served an apprenticeship as a boilermaker in that country, came to the United States a little before World War I, worked in the Mergenthaler factory, and eventually established a repair route, principally in South Dakota and southern Minnesota. He died in 1939 in Gettysburg, S. D., where he is buried.

This word of appreciation comes from one who has grunted many a time loosening a bolt that John had tightened — for he had that rare and priceless quality, a feeling for metal, the faculty of knowing exactly how far he could go without twisting off a bolt-head, and the stern control that kept him from going further. It still is possible to find machines in South Dakota that can, by the tightness of the bolts, be promptly identified as having been once in John Wagoun's care.

FOREWORD

When I was a small boy, my father had a newspaper at Slaton, on the South Plains of Texas. Help was scarce down there, except for an occasional tramp printer. A man who lived on a homestead came into town a few days a week to help out (his name is J. T. Pinkston, and he is still living on the same homestead); my mother worked several days a week in the shop; and my father and I, at my age of 10, made a business deal whereby I was to set one galley of 10-point, 13 picas, leaded, every afternoon after school, for 35¢ a galley. The first galley took me until 10 p. m.; after that I got home at a semi-reasonable hour. But any old-timer will appreciate the otherwise incomprehensible feeling of unattainability with which I viewed the first "typesetting machine" in the immediate area, which was in the plant of the *Lubbock Avalanche.*

It was completely incredible and utterly fascinating; it made the long hours on a high stool seem twice as tedious; it inculcated an overwhelming desire for mastery over such a machine that "set type" three or four times as fast as I could — and a lot easier. Two thousand ems an hour was a phenomenal speed in hand-spiking days; ten thousand was not uncommon on certain types of matter on the linecasting machine, and old files of *The Inland Printer* show the results of many speed contests (long ago outlawed by the Typographical Union) on linecasting machines. On small sizes, unusually adept operators reached 13,000 and 14,000 ems per hour; the average requirement now under union contract (and it is a reasonable standard from all points of view) is around 5,000 ems.

All these things entered into my early (age 13) acquaintance with the keyboard of a Model L, and my unbrookable determination a few years later to attend the Mergenthaler School in New Orleans. They have impelled me now to put the accumulated knowledge of myself and Ed Harding, and all the others, on paper. Perhaps as a result of my experience, I feel an unusually strong compulsion to answer the questions of the "small" machine-owner, as I have seen him during thirty years of repair work in a good many hundred plants. At least, help for him has been my guiding principle.

NOEL M. LOOMIS

ARRANGEMENT OF THE BOOK

This book is for the thousands of Linotype and Intertype operators and machinist-operators, in thousands of shops over the country, who want to know how to fix their machines when they have trouble. Most of these machinist-operators are in small plants, and a good many are far from populated centers where advice or help is readily available.

We try to deal with every-day problems on every-day machines such as are generally found in country plants and smaller plants in larger towns. Devices such as quadders and mixers are omitted; they are covered in more technical works available from the manufacturers. Most of the machines now in use in smaller plants are Linotype Models 5, L, 8, 14, and 15, and Intertype Models A, B, and C, and the Model Z of dubious paternity. There are still a few Models 1, K, 3, 9, 10, 18, 19, 20, 24, 25, 26 and X, and a few others, but the material in this book applies to them all in general. Extensive information that applies to one or two models alone has generally been omitted to avoid cumbersomeness. Any subject whose value is not sustained by experience has been omitted.

The double *e* attachment, for instance, which Loomis has never found in use in a small shop and seldom in a large one, has been reluctantly dropped. Specific information on recent models is not included. It is true that the bigger, more complicated machines are finding their way into the country, but they suggest material for another book entirely. A great deal of our material is applicable to current models, but this book is designed primarily for the man who runs a machine manufactured between about 1900 and 1940.

Also, it is our intent to lean away from diagrams and descriptions of how parts work, not because those items are unimportant, but rather because there are economic limits to any book, and we feel the ultimate aim of this book is to suggest why things do *not* work. Ever present in our minds are the questions asked by the men and women we want to reach. Moreover, the two manufacturers publish many books, booklets, and leaflets describing the normal functions of the machines. Many of these are free; others are inexpensive. The linecasting operator should not hesitate to write the Service Department of either Company to ask what material is available. We write them ourselves when a puzzler comes up.

Many machinist-operators of linecasting machines — let's call them m-o's, for that is the generally used trade term — being isolated geographically and economically, for over fifty years have been writing to various trade magazines for information and advice, and they have received printed answers from engineers and practical machinists.

As a matter of record, the first column in *The Inland Printer,* "Machine Composition Notes and Queries," conducted by George E. Lincoln, appeared in December, 1897. The very first advice he gave was, "When the average operator-machinist provides himself with a file, discharge him at once or hide the machine." There is still soundness in that edict.

The first question Lincoln answered was from "Bob" in Baltimore, Md.: "Can a machine be run without a font distinguisher?" He said it was possible but not desirable.

Many questions in the next few years were concerned with the composition of metal, but m-o's were more concerned with their speed than any other one item. It is interesting to note the questions asked about operation of the Thorne typesetting machine, which were answered by Mr. Lincoln with equal facility. (There were thirty-two makes of mechanical type-composers actually being manufactured at that time.) The only book on mechanism of the Linotype appeared to be "The Mechanical Details of the Linotype and Their Adjustment," by Frank Evans. Linotypes in those days did not have to be bought. They could be rented from Mergenthaler for $550 a year.

In 1899 Mr. Lincoln apparently went to work for Mergenthaler, and the column was "Conducted by an Expert." Charles Seaward wrote a book, "The Linotype Manual," for Mergenthaler. In 1900 the department in *The Inland Printer* was taken over by John S. Thompson, the dean himself, who also started a series of articles "By an Operator-Machinist," which in 1902 became his famous book. It will be noted that even then a man who was both an operator and machinist was selected to advise m-o's. By that time the designation "machinist-operator" was common. . . .

Some years later one of these machinist-operators, Thomas G. Allen, on the *Times* at Plainville, Kan., began to clip these questions and answers and save them in a scrapbook. Eventually he turned his collection over to E. B. Harding, who conducts the linecasting question-and-answer department in *The Graphic Arts Monthly.* Mr. Harding is an experienced machinist and operator, has been Associate Professor in the highly rated School of Printing and Journalism at South Dakota State College at Brookings since 1920, and is widely and favorably known as a linecasting machinist. He organized these clippings and added material which he himself had written over the years in the course of his teaching.

Harding turned all this material over to Noel M. Loomis, a Minneapolis man who went to the Mergenthaler school in New Orleans in 1922, and has spent most of his life around linecasting machines, sometimes as operator, sometimes as machinist-operator, sometimes as machinist in large plants — but for some fifteen years of this time he worked "on the road," repairing hundreds of machines in small towns from Louisiana to North Dakota and from Wyoming to Wisconsin. He encountered many isolated machines that never had seen professional service, and many cases where it seemed completely impossible for

the machines to be operating – evidence of their incredible durability – but never considered it a finished job until he had their trouble remedied.

Both Harding and Loomis wanted to prepare a book that would be helpful to the machinist-operator everywhere. The professional machinist has many sources of information, many other machinists to turn to, and an outlay of tools that may run into two thousand dollars, but the m-o is often the only person in town who knows what a linecasting machine is supposed to do, and invariably his equipment for repair is meager. With that situation in mind, we have devised the present arrangement of the book.

The question-and-answer method is used as the nucleus. The question is then treated as if in a clinic or round-table; the trade journal expert's answer, if available, is given; other authoritative sources may be quoted; Mr. Harding then speaks, where he has additional advice or a differing opinion, and Mr. Loomis's material is added where it is additional to all the preceding or differing from it. And, knowing that the greatest use of such a book comes when the machine is down, and the operator, with his hands hastily wiped on a rag, grabs up the book and thumbs through the appropriate section (you can usually tell what kind of trouble an operator has had by the finger-marks in his book) and tries to find something that will help him, we have tried to use heads and subheads as indicatively as possible. Also we have prepared a cross-index which we hope will be useful.

It is well to point out that there may be two or more correct answers to the same question – all sincere and all competent. For one thing, as in medicine, opinions generally believed supportable may change entirely within twenty years. For another and more important reason, conditions vary in the printing business.

The first general type of opinion is that of the engineer employed by the manufacturer of the machine. His situation is supposedly ideal and limited only by his budget. But his job is to make new machines perform according to specifications, and you cannot expect him to worry much about a machine that has been worn out three times – though he often does.

The second situation is in larger plants where full-time machinists are employed, where production demands on linecasting machines are exacting, where facilities for meeting these demands are provided, and where time is always of the essence. If the head machinist has met with understanding from the management, enough help is provided to carry out well-laid programs of maintenance. This viewpoint of the larger plant is represented, generally speaking, by the experts, such as Sinclair, from whom we quote occasionally.

A third representative situation is the school, where, to a certain extent, laboratory conditions prevail. In Mr. Harding's well-ordered plant, for instance, he had a schedule, he demanded adherence to it, and he did his utmost to approximate conditions as his students would find them – for Harding knows

what they will find. Nevertheless, he cannot plead the pressure of time that is encountered on a large daily newspaper. Nor does he, for his work is teaching, not meeting deadlines. Out of this more contemplative atmosphere have come contributions for which there is little opportunity on the big daily.

A fourth set of conditions prevails in the country shop. Often the m-o's experience is confined to one or two machines; he has no time for monkey-business; he works from Monday to Wednesday or Thursday night getting out the paper; he feeds the press, he helps mail; on Friday and Saturday he does jobwork. Repair work is usually undertaken only when he has a break-down; oiling and maintenance he manages in a quick hour on Monday morning, with the owner-editor making frequent trips to the machine with copy to emphasize the need to get underway. This situation is the domain of Mr. Loomis.

This country-shop m-o is the one whom we hope to benefit most, by bringing him the cream of experience from all four of the viewpoints described. We emphasize that variety of experience is another reason for opinions that differ but are wholly competent and sincere. It is possible for all those quoted to be right within their experience. It is also possible for all to be wrong. Certain questions about line-casting machines are still questions.

All clippings used have been re-worded and condensed to suit the market at which they are aimed. Questions have been paraphrased to make way for better coverage in the answer; answers have also been altered for the same purpose. Some questions, too, are questions that have been answered privately, but are used because they are representative. Harding and Loomis label their own opinions, well aware that they are in the enviable position of having a last word with no chance of a rebuttal by the original answerer, and desiring not to take advantage of that fact but rather to use it to present a fullness of opinion without argumentation.

Where it is possible, direct credits to publications and authors are given, but sometimes, to avoid a book of inordinate length, we have synthesized the opinions of many, including our own, and have presented them in a roundup of opinion.

We express acknowledgment and appreciation to the publishers of *The Graphic Arts Monthly, The Inland Printer, The Linotype News, The Printing Equipment Engineer, The Printing Industry, The Publisher's Auxiliary, Who's Who in the Composing Room,* and perhaps others, for their co-operation and for their permission to quote; to W. E. Barnes, William J. Butler, W. J. Freund, William T. Henderson, E. M. Keating, George Ortleb, Harry Pottle, H. C. Rockwell, Everett Shaffstall, MacD. Sinclair, and others — linecasting machinists in the best sense — for their answers to questions; to the Mergenthaler Linotype Company, the Intertype Corporation, the Imperial Metal Company and others for permission to quote from their material; and finally to Mr. Allen of Plainville, Kan., who patiently collected the material and then generously turned it over to others.

Permission to quote from any source does not, of course, imply either approval or disapproval of our handling; we have been entirely free to use such material as we think best in accordance with our own experience. Also it should be noted that there may be unintentional errors in giving credit, such as might arise in the handling of a great mass of clippings that would have made a book ten times the size of this if used in full.

Loomis: It is worth noting that this may be the only book about linecasting machines actually written on a linecasting machine. Harding, whom I have known for a long time, turned a mass of material over to me to check and to cut drastically and to add opinions of my own. In the meantime I had bought a Model 15 Linotype for my personal use (not for commercial use) and for experimentation. As a Model 15 it might astonish some persons, for it has an inclined galley built from Intertype parts which I picked up from a Mohr saw installation and maneuvered into place. It has a galley-long stick with a bell which rings when it is full; it has a gadget by which I can prevent any line from casting; it has a copyboard 18 inches long and 12 inches high; and it has a Model 18 pi stacker. Don't misunderstand. Generally speaking I do not like gadgets on a linecasting machine, for too many gadgets are used to do a job that some original part has failed to do but would do if properly adjusted. All these additions but one (the split line-stop lever by which I can prevent casting) are really installations of more modern equipment, applied to an old machine. Why did I get a Model 15? It was inexpensive, and it was small and would go in my basement. The basement is tiled, ceiled, and painted, and I wanted a machine that would act like a lady — and the Model 15 does. I could almost put it on the rug on the living room floor. But let's not go into that. So far my wife's part is limited to proving up galleys and reading my final proofs, and perhaps we'd better keep it that way. But I repeat one point: every final word in this book for m-o's was written on a linecasting machine. It has afforded unparalleled opportunities for checking parts and procedures.

Nevertheless, in a work of this scope, it is inevitable that there will be errors of commission, not only from the complexity of the subject but also from mechanical deficiencies of the human brain. We invite readers to call attention to these.

EDWIN B. HARDING.

NOEL M. LOOMIS.

Brookings, S. D., and

Descanso, Calif.

CONTENTS

The arrangement of a book on line casting mechanism is always a matter of debate. In this book we have started with what we consider the first item to be considered – the matrix. We have started with it in the magazine, and have followed it through the machine, and as far as possible have taken up each assembly in the order in which it is encountered in the normal revolution of a machine. For quick reference, therefore, we list the chapter numbers and the scope of their various subjects:

LINECASTING OPERATOR-MACHINIST

CHAPTER 1

KEYBOARD TROUBLES

(AUTHORS' NOTE: This chapter on keyboard troubles is a long one, for four reasons: 1, the subject of assembly is the most complex of those dealing with a linecasting machine, for, as at present constituted, assembly depends to a large extent on gravity; 2, it accounts for probably 50 per cent of all the trouble on the average older machine (25 per cent — roughly speaking — being attributable to distribution, and the other 25 per cent to casting); 3, it is the immediate concern of the machinist-operator, for he knows that if he can get a slug, the pressman will manage to print from it, but until he can get the mats in a line, he can't get a usable slug at all; 4, keyboard troubles account for a very large percentage of the questions asked by country-shop operators of a traveling machinist.)

MAT FAILS TO RESPOND

QUESTION: When a mat fails to respond, where do you start looking? There must be some system for tracking down the trouble.

EDWIN B. HARDING (E. B. HARDING) in *The Publisher's Auxiliary*:

First, let us assume the mats and magazine are reasonably clean. Then, for the benefit of the beginner, we'll start with the most common cause:

A. A distributor stop. When the experienced operator misses a mat, he will invariably glance first at the distributor.

B. Be sure the keyrod is rising and falling. (These are sometimes called keyboard rods, but more often are spoken of as "reeds.")

C. See if a mat is in position to drop from the magazine. *If the channel is empty at the bottom of the magazine,* have somebody hold the light at the edge of the magazine while you look down from above. One or more of several things may be seen:

The channel may be empty, in which case take inventory of your mats. Have you got them all in the tray or in a long line, or have you dropped a lot of them on the tray under the distributor and failed to pick them up and put them back in the magazine? Don't allow your pi to accumulate more than 12 or 13 picas.

Mats Stuck in the Magazine

You may see a mat in the magazine flatwise, in which case it is safer to use a long hook and pull out the mats from above; the wedge shape of the magazine often leads to trouble when you try to pull them out from below. You can, however, run out mats in the nearby channels, and sometimes a poke from below will loosen the flat and it will fall out. An operator should have two mat hooks – one 12 or 15 inches long to be used at the front, and another the length of the magazine, to be used from the back. These can be made from wire coat-hangers; the heavier wire is best. Straighten the wire, clamp it in a vise near one end, and hammer the end into a 90° angle, then file off the "hook" part until the hook is not over an eighth of an inch long. Break the sharp corners. Make a loop in the end you will hold, and make it so the open part points in the same direction as the hook. This may save getting the hook caught in the magazine.

You may find a mat with a bent toe or ear; most of these will be *i's, l's,* periods, and commas. Usually this mat will stick near the top of the magazine, but if it is bent just a little, it may stick near the bottom. If at the bottom, try your short hook on it – not too hard. If it is willing to come, pull it out as you work the key-button. If it resists, take it out from above, to avoid getting it stuck in the magazine.

You may find a mat in the wrong channel. Treat it the same as a bent mat.

If you are using old mats in a newer magazine, you may find burrs on the toes of the mats that make them stick. That's what mat files are for – but use them sparingly, to take off the burrs only. *Warning*: It is criminal to use a mat file indiscriminately. You soon thin out the toes and get in all kinds of trouble. Use a mat file to dress off burrs, and then lightly.

Of course there may be foreign matter in the magazine. I have seen mats come through upside down without assistance from practical jokers; I found a nail file in one magazine; and I'll never forget the day a penny rolled into the assembling elevator.

Mat in Place but Won't Drop

On the other hand, you may find the right mat in place, undamaged but not dropping. Run the channels empty on each side. See if the pawl is going up and down. If not, the keyrod may have slipped off the verge. On a Model 5, the tops of the keyrods are adjustable by a screw bushing, usually set on the lower case *p*, but you will have to examine the lineup for its full length, and may have to shift it a little one way or another; also, even after this, it is usual to have to bend the tops of some of the keyrods a little to align with the verges. If not, they may bind and not pull the verge back down. Also, the springs occasionally slip off the verges.

Use your short hook and get the mat out as gently as possible. Turn the rubber roll by hand. holding the light with your other hand. Get your eye

down on the same plane as the floor of the magazine and observe if the pawl goes below the bottom of the channel. It should. If it does not, you have worn parts. (See Loomis' comments for a more extended treatment.)

On the Models 1 and 5 and similar escapements, see that the keyrod rises high enough to clear the verge by 1/32" on each end of the verge frame. There is a screw adjustment on the magazine frame.

Sometimes an escapement spring will wear out and break at the point where it rubs against the verge, leaving a sharp end that will gouge and hamper the verge's motion. This applies also to other models. On the Model 15, a characteristic trouble is caused when a verge spring is not absolutely parallel with the slot in the verge. The best remedy is to flatten the spring from the sides – on the business end, of course. Use a small hammer.

Verge Plates and Escapement Covers

Rarely you may find, in putting a magazine on a machine where it has not been used before, the verge plate does not align with the magazine channels. Verge plates on the older machines are adjustable sidewise and usually are set on the lower case *p*.

It is possible also to find the plate (escapement cover) across the top of the magazine damaged – but Bill Gordon of Minneapolis called my attention to the fact that a slight bow does not indicate damage. I checked with Mergenthaler, and this is their answer: "This escapement cover has been designed with a slight bow [so the cover will] fit snugly down to the magazine. . . . This design applies to both old style or new style magazines."

Damage to Magazines

Sometimes you may find a burr in the magazine itself. If near the end, it can be reached with a nail file or magneto file. If in the middle – which is not likely unless you have been careless with the mat hook – there is a broach that will remove it. And yes, in extreme cases a magazine can be taken apart, but one should be certain of the necessity, because it is a difficult job to put it back together. (See *Taking a Magazine Apart*, page 51.)

Escapement Pawls

It is possible also to find two thin mats jammed together in one channel, or a mat with its ears reduced too much by filing, so that it slips alongside a worn pawl. This can happen on a badly worn pawl without the mat's having been filed, usually on thin letters like *i* and the period. In such a case, use a jeweler's file and widen the slot in the verge rack so you can install a thicker pawl.

Goosenecks

In a Model 8 or 14, the escapement lever (gooseneck) may be bent.

Escopement Plungers

Run the magazine up and push in the plunger by hand. It should work freely. If not, take off the verge rack, take out the plunger; rub it on emery paper and then on a graphite board. Rub graphite over the end when it meets the gooseneck. See that the plunger is not bent so much it binds, but WARNING: sometimes a plunger is bent a little to function properly; do not straighten unless the bend interferes with its movement.

Mot Drops When Keyrod Worked by Hond

D. If you have not found the trouble yet, try the keyrod up and down by hand with a pair of duckbill pliers.

If the mat drops readily, the trouble is usually below the keyrod. Check the following:

Deep grooves worn in the rubber roll, or rolls shrunken after long use.

Keyboard speeded up (see Loomis' comments on keyboard speed in *How Fast Should It Run?* page 16.)

On Linotypes of Model 8 and later, the plunger over the outer end of the cam yoke may rise too much and rob the inner end of its proper motion. You can make a small spanner wrench of an old liner to turn down the screw and tighten the spring, or you can work it down with the corner of a small screwdriver. (Mergenthaler makes a wrench for this – part No. H-1425.) WARNING: this plunger should not bear on the cam yoke at the rest. It should clear by .005" or more. You can file a little off the end of the plunger if necessary.

If the Keyrod Does Not Function:

E. On an Intertype, examine the spring between the two parts of the keyrod. Sometimes it breaks or slips off; sometimes the parts get shoved together and jammed.

On earlier Linotypes, the keyrod spring may be broken, allowing the keyrod to stay in its upper position.

On Linotypes, remove cam cover and see whether the cam drops to the rubber roll.

If the Com Does Not Drop:

F. Either end of the cam yoke may be gummy; rub both sides with a mat eraser. There may be a kink in the cam wire or the trigger wire; move it one way a quarter of an inch. The wire may be rusty or extremely dirty. The trigger might be gummy. The keyboard locking bar may ride too low. The banking bar may have had the pins pulled out and may have worked too low, preventing a full upward stroke of the weights. There should be .005" space over the pivot end of the cam yoke (new style).

If the Cam Draps But Refuses To Turn:

G. The cam pivot may be dry. Oil with a toothpick; wipe off surplus. The rubber roll may have become glazed; roughen it with sandpaper. Washing in soap and water is excellent for the liveness of the rubber. The cam or the pivot may be worn, allowing the cam to run far out of alignment and rub against the yoke. The yoke itself may be filled with dirt — usually cut from the rolls by the cam. The stop pin on the "comb" may be bent.

If There Is Still Trauble:

H. Be sure the rubber rolls are fully one inch in diameter all the way across. Measure with micrometer.

You may weaken the verge springs a little on all machines whose keyrods return by gravity. Try one or two first.

Remove escapement cover and with a piece of emery cloth over a one-point rule, dress the channel a little.

It is possible that a magazine binding screw has been turned too tightly, swelling the channel.

Thick Mats

On thick mats, as 14-point, some mats may hit against a tooth on the matrix channel guard strip at upper end of magazine; twist off the tooth with duckbills. Also, an unusually thick mat to the right of a magazine partition (this happens in aligning gothic, with three sizes in a magazine, where the mats in center section are badly out of place) may occasionally rub against a magazine binding screw down toward the bottom. Mark the head of the screw on the right side and take it out; grind down the body of the screw on that side, then put it back — but carefully, for now this screw is pretty fragile. Be sure the flat side faces the thick mat.

Clean The Magazine And Mats

1. Finally — we said this first, but it will stand repeating — *be sure the magazine is clean.* Brush out all black spots. There may appear to be dents in the channels, but you are looking at them from an unusual angle, and the dents are not as large as they seem except on an excessively used Linograph magazine, where no particular trouble will occur if it is kept clean. When you are cleaning, watch the narrow channels and the channels next to magazine partitions. (See *Cleaning Magazines,* page 31.)

NOEL M. LOOMIS:

This subject has been covered systematically, but I would like to add a few suggestions. I agree that the first place to look is the distributor, then the keyrod (I usually observe whether the cam is turning over by listening); then into the

magazine for a flat if there is no mat down in place; if it is there but won't drop all the way out, and if there is nothing wrong with that particular mat, and especially if the trouble is repeated, and repeated by other letters also, then you may very likely find worn parts.

Toes Sticking Out

When the toes of mats stick out but the mat doesn't drop, worn parts usually are indicated. This happens more often on Models 8 and 14, because they have a longer series of parts involved. If there is a mat in place, I clear the channel and two channels on each side and get my eye down on a level with the floor of the magazine, with the light beside it, and turn the shaft by hand to observe if the pawl goes down even with the bottom of the channel; if it appears to do this, then try it under power; sometimes the result will be different (this would indicate a gummed-up verge that works too slowly).

The Pawl Must Go to the Floor of the Channel

If the pawl does not plainly clear, we'll start at the bottom and work up — but first, hold your finger on the overthrow spring at the end of the keyboard cam yoke and see if that makes the pawl go down; if it does, turn the screw down on the spring and put a drop of oil on the top end of the plunger.

Examine the rubber roll shaft bushings; on an old machine — i. e., around 30,000 serial number or under — or machines that have been pretty well pounded, you may find considerable vertical wear; the bushings should be replaced. Be sure the rubber rolls are good.

The Goosenecks, or Escapement Levers

Turn the magazines up to the top, to clear the goosenecks. Turn off the power. Hit the offending keybutton and about two on each side of it; turn the roll by hand and observe the tips of the goosenecks at the top of their stroke; sometimes you will see a lot of difference. The top of the stroke here should be nearly the same for all. Lay a piece of patent base on each side of the gooseneck that is short; pull out the hinge rod, all the way, for you will have to emery it and polish it before you put it back in. Peen the tip of the gooseneck; you can add a sixteenth of an inch if necessary. (You'd better order fifteen or twenty new ones; if this is your trouble, there will be more of it.)

Plungers and Verges

But maybe the goosenecks have already been replaced and look good; let's go higher. Occasionally you will find a deep gouge along with red rust, in the end of the plunger — not often, though. More often you will find a big dent in the verge where the plunger impinges on it. Examine all the verges, particularly the first eighteen or twenty-four, the em quads and leaders, the period and comma, and the dash. Also you may find a verge with a badly worn pivot-hole

which allows it to lose its motion; test for this by pushing down on the top of the verge with a small screwdriver. Push in the end of the plunger a few times to detect gumminess or resistance to free movement. Some m-o's have used clock oil on verges with success.

Remove tbe plunger; polish it on emery cloth and graphite on the space-band board or with the fingertips. Tap off surplus graphite. Sometimes they are bent — and sometimes they are supposed to be; don't be in a hurry to straighten them; find out first if that's the trouble. It it is, there will usually be a groove in the rubber roll.

Replacing Verges, Pawls and Plungers

You can take out one verge without removing any others. First take out the plunger if an 8 or 14; then fasten the plunger bar (cover) back in place. Get a 1/8" piece of drill rod, bessemer steel, or bronze or steel welding rod about the length of the hinge rod or a little longer; grind the leading edge at a bevel until there is no more flat on the end than the size of a pencil-lead. Push this end in against the hinge rod. Tap it gently. Stop at once if it hits something solid. You can tell when it reaches the right spot, for the verges move up a little as the smaller rod enters them. Take out the verge.

It may be merely gummy or dirty; if so, wash with carbon tetrachloride or rub on strawboard or emery cloth to take off dirt; then rub on chipboard with graphite, or replace without graphiting. Jiggle the verge to make the pawls drop in place. But before replacing, use a 2-point brass rule and a cloth wet with tetrachloride and clean out the slot.

But let's say there is a hole worn in tbe verge where the plunger hits it. If you have a new verge of the right size, you probably will have to ream out the hole a little or file it with a small rat-tail file; try it on the old rod until it works freely — but not sloppily! If the pawls have nicks in their upper edges, they also should be replaced. When you put them back, the steps go toward the front of the machine.

Note that there are seven or more thicknesses of verge. Lists of the correct size for each channel are given in parts catalogs. If you do get them mixed up, you can mike them and get them straightened out. Don't try fitting them by guess; some are within .005" of each other, and you might be able to get a thick one in between worn partitions, but pretty soon you won't be able to get anywhere. If you mike them, note that verges usually measure from .002" to .005" under the book-size. When ordering it is safe to specify what letter it is for.

Harding points out that the verges on the cap side are set at an angle, and you must be sure the verge is free on the rod at the exact angle at which it has to work. He also mentions graphiting the hinge rod. On principle I believe in this too, although I have come to question its value. At any rate, graphite it by rubbing with the fingers, and leave no surplus to cake up.

To Remove Verge Rack from Model 5

QUESTION: The verge rack on our Model 5 needs cleaning, for I can see the verges sometimes return very slowly. The trouble is, I don't know how to go about it. What do you advise? — X. M., Buffalo, Wyo.

LOOMIS: The verge rack, or verge block (its technical name is "escapement, assembled") may be in one of many types. Some slide into place like wedges, others are hinged, while still others are held by screws and dowels.

To remove the Model 5 verge rack: Lock the mats in the magazine and remove the magazine. Low on the right side, next to the spaceband keyrod, is a short lever that swings upward in a very short arc. In the lever you will find a stud that seems to be there to lock the lever in place when you raise it — but you will not find a corresponding hole in the frame unless some traveling machinist has drilled one there.

It is a good project to drill that hole. Remove the pin and use a ¼" drill. That should fit the hole (but check to be sure). If you can't manage drilling on the machine, mark the lever through the hole with a sharp needle around the peripery; then drive out the taper pin and remove the lever and drill the frame. If the hole turns out to be a little off center, drill it a fraction bigger — or, if drills are hard to get, grind off the pin on one side so it will go into the hole.)

If there is no hole, and you cannot drill one as suggested in the preceeding paragraph, then get a 10 or 12-point linotype slug and cut it in a long bevel length-wise of the slug. Raise the lever and fit the slug under it to hold it up. The lever raises the keyrods off of the verges. Now, with the keyrods up, press down on the small lever under the verge plate at the right end. Push the keyrods back in their guide plate. Now remove the two screws that hold the verge rack — one on each end. Lift the rack off of its dowels.

Proceed with cleaning as above.

Intertype Verges

An Intertype verge is in one piece that includes the pawls, and also comes in different thicknesses. On an Intertype magazine, take a piece of old brass column rule as long as the verge assembly; notch it in the middle of one side to go around the center bar of the magazine; now hold the straight side against the projections on the verges which receive the impact of the keyrods (just under the keeper wire); push down hard; get all the verges down and turn the column rule toward the top of the magazine; if the notch fits around the center bar, the column rule will stay there while you take out the wire. Then release the rule to remove a verge. You can also use a magazine brush handle to depress the verges.

Clean the verge the same as a Linotype verge. When you are ready to replace the wire, use the rule again the same way. Those keeper wires cause most of the trouble you will encounter with Intertype verges; they become bent or rusty or dirty, and so be sure to polish them, or, far better, have a few new

ones for replacement when one gets beaten up. Sometimes the Intertype escapement spring is weak or broken; test it with the others to be sure of its strength.

How to Repair a Warn Verge

If you have no new Linotype verge but must repair the trouble anyway, put the old verge in a vise. On a Model 8 verge, about 1/8" behind the worn spot, cut into it with a hacksaw, straight down, about 3/16" deep. Put the blade of a small screwdriver into the slot and cautiously pry out until you have enough; take a file and dress off the worn surface, restoring the original level. Oddly enough, I've never seen one of these break in use — but I don't guarantee it. Order a new one.

On Model 5 verges you will have to start about 3/8" down from the tip and saw at an angle — not directly crosswise. About 3/16" deep. Angle toward the center hole. Then put the verge in a vise with a small screwdriver through the pawl hole under the tip to keep the verge from moving, and tap the tip until the saw slot widens a very little. File or grind the worn spot smooth. You can check the amount of bend — which need be but little — by using 5/32" rods through the pawl holes (old assembling elevator hinge rods are the right size) and lining the repaired verge up with a new one or an unworn one.

I don't think there is any satisfactory way to repair a worn center hole in a verge.

Verge Springs

Replace the verge; push the hinge rod all the way out; polish it and bevel both ends; put it back. Replace the plunger. Now with a small screwdriver (and when I say "small" I mean one of these ten-cent pocket screwdrivers, because you can feel better with them) try the verges against the springs; the tension should be somewhere near the same; too strong a spring will resist the stroke of the gooseneck and throw the motion back onto the rubber roll and into the cam yoke overmotion spring; too weak a verge spring (escapement spring, more properly) may fail to return the pawls to position and result in another miss. Verge springs as they come are pretty strong for an 8 or a 14; invariably I weaken them until the spring, in its hole and out from under the verge, will stand up about half an inch above the surface of the verge at the point where the spring goes under it. If you are putting in a new spring, it is often a good idea to flatten the sides of the curve a little with a small hammer so the wire won't bind in the slot.

Rough Surgery

Besides stretching the goosenecks, you can also stretch the keyrods (but it is not ordinarily convenient); you can split the free end of the cam yoke about an eighth of an inch from the top and about a quarter of an inch deep, and spread it the same as the verge (but this is a poor method which may lead to complications, and should be used only in extreme emergency).

Raising the Keyboard

One of the best methods I have found to put new life into an old keyboard quickly is to raise it. Loosen the 5/8" bolt at the side and the two big bolts beneath and put two-point leads at all four corners. A two-point lead is about the limit; I have raised them four but ran into trouble with the assembler entrance; however, two points will help a lot if it isn't too bad already. You may have to remove the bolt at the side.

Trigger Bite

On old keyboards, the trigger bite sometimes is found excessive — due to wear in the series of parts below the trigger — and I have been able to make a quick repair by filing out the cam yoke to reduce the bite. This also is complicated, for you will be under the necessity of keeping that cam in that spot forever — or however long a linecasting machine lasts. (See *Cleaning the Keyboard* page 45, for details on replacing worn parts in the keyboard itself.)

Sidewise Adjustment of Intertype Keyrods

It is well to note that later Intertypes have a lower sidewise adjustment for the keyrod bank, to center the rods over the cam yokes, and also a sidewise adjustment at the top, for centering on the verges.

Cam Frames

On older machines the cam frame and its two end pieces were not always well fitted together. I remember a Model 5 in a brief shop in Oklahoma City that caused trouble for a year or more; the caps on the back side would not drop consistently. Eventually it occurred to me that whenever I put the cam frame back on I had to force the pins into their holes. First I tried grinding down the pins to fit loosely — which was not the right thing to do; besides, it didn't work. Eventually I removed the end pieces and filed them down by hand across their entire inner surfaces (first I filed small grooves to give a guide on the depth). When the keyboard was put back together the new pins went in easily and the keyboard ran like a watch. But don't try this sort of mayhem unless you are very sure it is called for. Otherwise it may be difficult to explain to the boss.

Somewhat the same trouble may occur if you tighten the long screws that hold the end pieces to the main part of the frame; they are not binding screws and not intended to be tight; their purpose is to keep the three pieces together. Sometimes also the set screw that holds the rubber roll shaft bushing, if tightened, will cant the bushing and slow down the roll. Often those set screws have to be run loose.

Assembler Entrance Partitions

A mat may be slowed or blocked by hitting on an assembler entrance partition. Also on occasion, if you have been adjusting the plate that holds the partitions, you will find a curious condition: mats will start out of the magazine,

come about half-way, and stop. This is different from the trouble indicated by toes sticking out; it is caused by the plate being too low. The toe of the mat is not supported as it leaves the magazine; the mat makes too sharp a curve downward, and the upper ear binds against the magazine and holds it back. (See *Lining up the Assembler Entrance Partitions,* page 58.)

Cam Teeth Worn

On an older machine, the cam may drop to the rubber roll and just not turn over, even when the roll is good and there is nothing binding. This may be due to worn teeth. They sometimes become smooth and will not take hold unless the roll is fresh and live. In this case, take a small three-cornered file and cut new, sharp notches – but order new cams, for the diameter of the cam is now reduced and you may have trouble up above.

Loosening Magazine Screws

There are times when a mat seems to slow down in the magazine and go through the channel reluctantly; sometimes it will help to loosen a magazine binding screw in that region. And I can't forget the old beaten-up Model 5 out in northern Colorado; they had hauled it across-country and put it together, but the mats wouldn't come out of the magazine. The mats would wiggle when you worked the keyrod, but they wouldn't drop out. You could pull them out with slight pressure of the hook. We fought it until five o'clock in the morning but got nowhere; we stopped for coffee, and then, feeling a little relaxed and warmed up by the coffee, and watching the sun come up over Julesburg, I reviewed the situation. Presently I got up and announced: "It has to be that; it can't be anything else." I went back and looked – and it was that: very small burrs at the bottom of the channels at the very end of the magazine. Sometimes the mats would jump over, sometimes not. How the burrs got there I don't know; there were no bruise-marks; they appeared to be the result of long usage of some sort. But we filed them carefully, and the mats poured out like nobody's business.

Exploratory Operation on Magazines

When the mat comes down close to the pawls but just doesn't slide out, Harding and I agree that when the pawl seems to function properly, it may be desirable to look into the magazine. Harding points out that on older magazines with a hole on each side about three or four inches from the bottom, it is simple to put a round locking rod through (older machines came equipped with this rod), run two mats out of each channel, and take off the escapement cover. On newer magazines, however, the holes may be lacking. Run out all the mats in the two channels on each side of the offender. Carefully lift off the escapement cover. Get a good light and a pair of tweezers and examine the mat and the channels carefully. You may find a burr that you have not seen before or

a slight misalignment of the magazine channel and the verge plate channel that causes a mat to bind because the two channels are not parallel. Very, very careful filing will remedy this — but be sure first. When the mat stops, use the tweezers to move first one corner, then the other corner, sidewise and vertically. If the bottom toe persists in crowding one side, first try thinning the toe to prove the point. If that works, either thin them all or repair the magazine with great caution.

But first be sure the mat is not bent, by holding it between two thick pi mats, and be certain the retarding agent is not dirt and not some agent that has been used to clean the magazine. (See *Cleaning Magazines,* page 31.)

Spaceband Keyrod

A word about the spaceband keyrod. Most machines require a spring on the keybar or weight to counteract the weight of the spaceband lever; this spring should be just strong enough to pull the weight back in place with sureness. Then there is a spring to pull the keyrod back into place; this should be just strong enough to perform its task. It often happens that the spaceband keyrod will become worn down an eighth of an inch at the point where it rests on the keyrod banking bar; in emergency this can be repaired by pinning or screwing a piece of an old keyrod over the worn spot (solder won't hold very long). The top end of the keyrod should not have much looseness about it; if the holes are elongated, you may drill them out to three thirty-seconds or more and use a cotter key to fasten them together.

Mysteries

There are three more mysterious things that can happen to a keyboard. (There are a lot I don't know about, too.) This is the situation in which the rubber roll turns, and the cam is perfect, and it drops, but it doesn't turn. This can result from one of three causes: 1, if on the end, the roll may have crept out from under the cam; 2, gasoline or oil on the roll; 3, on older machines with two pulleys on a double belt, the roll may be running backward (I made a long trip in central Nebraska to fix this one). (And there was the keyboard in southeastern Louisiana that consistently doubled on about eight letters; eventually I discovered the operator had spilled Coca-Cola on that section of the keyboard. He'd tried to remove it with gasoline, but Coca-Cola is more soluble in water.)

Too Many Flats

One thing more: if you get too many flats in a magazine, see if the stop trip is in at the top. Many older magazines have had the stop strips removed because the m-o's found them in the way when they did get a flat. But the strips stop most of the potential flats, and should be in place. Intertype magazines do not have them.

Delayed-Action Response

QUESTION: My lower case *r* periodically drops late. It seems to work fine when I am trying it, but after it has not been touched for a minute or two, it will drop late or refuse altogether. I don't think it's my fingering, because sometimes it is two or three letters behind. Can you suggest a remedy?

LOOMIS: Sometimes this is a hard one to catch. Often it shows up as a simple but persistent transposition, but sometimes a mat will drop several characters late.

Sometimes these are so tricky to catch that I have tied a white flag (small piece of cloth) to the keyrod to observe whether the fault is in the keyboard or in the assembler.

First, be sure the cam is oiled and be sure it is dropping to the rubber roll. Be sure the mat is not hitting on a partition. See that the belt from the main drive pulley to the intermediate shaft is pulling; see that the keyboard belt and the assembler drive belt are tight; see that the matrix delivery belt is reasonably tight and running freely. Sometimes when the upper idle pulley and stud become too worn, the pulley will cant and throw the belt against the assembler entrance plate; also sometimes a gummy substance accumulates on the matrix delivery belt supporting plate beneath the belt, where, unseen and unsuspected, it drags on the belt and slows it.

How about the assembler chute rails; are they sticking up so as to occasionally stop a mat? Is there a space at the top of the rails where a mat can catch? Back off and watch the assembler pulley; is it running steadily or does it slow down? See also that the assembler cover (the small one) is not pushed in under the larger plate so the mats can hit it. Sometimes the large plate will be sprung so far away from the matrix delivery belt supporting plate where the delivery belt runs, that mats will get half caught in the crack and be stopped until another mat breaks them loose.

When a cam works well as long as you continue to hit it, but refuses to operate willingly after it sits a few minutes, look for one of three things: a dry pivot, dirty cam yoke ends, or a kink in the hinge wire (or, as a corollary, the hook at the end of the cam yoke is tight on the wire; spread it just a little with a screwdriver).

DOUBLES

QUESTION: We are having lots of doubles on our Model 8. Do you think we need new keyboard cams? — R. C., Norwood, Minn.

HARDING: I doubt it. Your keyboard probably needs cleaning.

Weights

Until that can be done, here is a quick remedy: Fill a large oil can with clean, high-test gasoline, or at least white gasoline (no leaded gas, no benzene, no alcohol, and no type-cleaner or carbon tetrachloride). Get a light and look

under the rubber roll on the back side. Just below the roll you will see a squarish bar behind which you can just see the tops of the weights. This is the banking bar, and dirt around it accounts for a lot of doubles. Put the spout of the gas can in just above this bar, no higher than absolutely necessary, and flush the entire length of the bar liberally. If you get gas on the rubber roll, wipe it dry. This will last for a week, and sometimes much longer.

Have somebody hit the keybutton while you watch the weight. If, after the flushing, the weight still sticks up, double a piece of emery cloth and hold it between the weight and the bottom of the banking bar, having someone hold the key down firmly while you pull the cloth out several times. A banking bar becomes worn and even grooved and this will smooth it a little.

Key Levers

Dirt or rust or gummy substance on the keylever, where it enters the keyboard, will cause doubles. Withdraw the fulcrum rod carefully and take out the key lever; emery it; use a slim warding file to clean out the slot *but do not enlarge it.* Then holding the key lever by the keybutton, you can maneuver the lever back through the slot at the back of the keyboard and into the notch in the weight. Be sure to polish the fulcrum rod with emery cloth.

Often a little dirt can be cleaned from the lever by taking hold of the keybutton firmly and working it vigorously up and down, first against one side, then the other. Squirt some gas on it to help.

If you have had the key lever out, you may have sprung it a little putting it back in. Push the keybutton from side to side and see if it is free in the slot. If it persists in rubbing against one side, it probably is bent. Take it out and straighten cautiously with your fingers, holding it up to your eye to see when it is straight.

Stop Strip and Stop Pin

With a light, take out the cam and look at the stop strip. If there is a bright spot at the end of the tooth, slightly beveled, the cam may be slipping under. Now examine the stop pin in the cam itself. You may find a groove in the pin that makes doubling easy.

Banking Bar out of Position

LOOMIS: Sometimes the pins have been taken out of the banking bar and the banking bar moved up too high. This reduces trigger bite and may make doubles. (See *Adjusting the Touch on a Keyboard,* page 47, for correct setting of the banking bar.)

Also, if you have previously filed off the trigger seat of a cam, and then gotten it back in the wrong place, or if perhaps filing off the seat was not the answer to your former trouble, you may now get doubles from it.

On an Intertype the locking rod may slip down a little so the weights occasionally stick on it long enough to produce doubles or continuous response.

Double Spacebands

QUESTION in *The Graphic Arts Monthly:* We are getting two or three spacebands at a time on our Model X. Please suggest a remedy. – H. M., Genoa, Ohio.

HARDING: The answers to the previous question on doubles apply to the spaceband also. There is an additional cause, however: insufficient spring tension on the keybar or weight. There should be enough tension to pull the weight down surely against the weight of the spaceband key lever after each stroke.

LOOMIS: There is also another cause of trouble that shows up particularly with the spacebands; when the spring on the keyrod (the upper spring) is too tight – and many of them are – it will cut a groove in the rubber roll, and the cam will sometimes be able to go under the tooth on the stop strip for that reason.

Continuous Response

HARDING: Continuous response is often a development of double response. The usual causes:

A. A chip of metal in the slot below the keybutton.

B. The cam stop strip tooth broken.

C. Stop pin worn deeply on the keyboard cam.

D. Too much filing on the trigger seat.

E. A worn-out trigger or one damaged when putting the keyboard back together.

F. Intertype keyboard cam inserted crooked and the screw tightened with cam out of position.

LOOMIS: If you have just had the cam frames off, you probably tightened them up with one trigger out of position. Try it again, and be sure you first lock all the triggers through the upper hole. But straighten your cam frame wire first.

Suggestion: If a stop strip tooth is broken and you do not have a new one, temporarily you may take another old one (broken in a different place), use longer screws and superimpose it over the one you are using. Or you can bend a paper clip or other small wire, fasten it under a screw, and make a temporary stop.

Mats Drop When Not Hit

LOOMIS: There are three situations in which mats may fall without invitation: 1, when a key alongside or in the same row is struck; 2, when mats are dropping from the distributor bar; 3, without relationship to other movements.

In the first case, usually there is some physical connection between the two series of parts involved below the keyboard cam. The hole in the key levers may be rusted so that the fulcrum rod moves a little; there may be an unusual accumulation of dirt that causes one weight to raise another; there may be unusual burrs at the tops of both weights; the upper or lower keyrod guide may be badly worn, allowing one keyrod to rub against the other; the trigger seat of the second cam may be so short (we sure got into a lot of trouble by filing that thing, didn't we?) that a heavy touch on the keyboard will jar the cam into action. I have seen the far end of the key lever, that fits into the notch in the weight, so burred that the burr would rub against the other weight.

Second, note if this happens when mats of the unwanted channel are dropping from the bar. This is true of heavy mats, particularly the em quads, and is not uncommon on Intertype magazines. Strengthen the verge spring. Occasionally a medium-weight letter, such as lower case *h*, will drop from the impact of mats from above; same remedy.

In the third case, look for the same items that cause doubling: short trigger seat, worn stop tooth, worn stop pin, groove in the rubber roll, and so on.

MISCELLANEOUS

How Fast Should the Keyboard Run?

QUESTION: Can I speed up the keyboard by putting string around the upper pulley? I am gaining speed, and the keyboard is getting too slow for me. — D. McG., Wausau, Wis.

LOOMIS: Don't do it without knowing the revolutions per minutes your keyboard is making already. I had a job once as an operator — I won't say where; it was a long time ago and a long way from Chicago — and I thought I was pretty fast. So I was. I built up the upper pulley. A few days later the heavier mats in the 12-point failed to drop. I could not find out why. My employer finally wired Chicago, and a factory man came out. He looked the situation over and said, "Got a sharp knife?" I gave him one. He cut off the string and tightened the belt. "Try it," he said. I did. The 12-point dropped perfectly. So I learned something — at somebody else's expense, as all of us learn many of the things we learn.

I am grateful for one thing: factory men did not then get the $8.00 an hour they get now — although they got considerably more than $1.00 for two hours, which was the rate in New York City in the late 1890's.

Newer Intertypes have rubber rolls turning at as much as 360 r.p.m. and seem to work very well, but older machines won't take it.

When the rubber rolls are turning over in the neighborhood of 300 r.p.m., a heavy mat does not have time to clear the magazine. Also, you will find yourself missing doubles because the cam does not turn over as fast as you hit the keybutton. I have been timed at eight letters a second on a 280 r.p.m. keyboard, and that's fast enought. Most keyboards run best at 280 r.p.m. Some of the fastest keyboards I have ever seen – down in Texas in piecework days – never went over 280. Many will not perform at all at 300. You can borrow a speed indicator from your friend in the garage and time your keyboard rolls. If you can't get an indicator, tie a small white flag on one spoke of one gear, or dab a spot of white paint on the pulley, and get somebody to hold a watch with a second hand while you count. With a few trials you'll do pretty well. Then keep your keyboard speed at 280 or below. If you speed up the machine itself, *cut down* the keyboard speed to 280. I've run machines as high as 10 lines a minute, but always the keyboard speed was held down.

Keyboard Locking Rods

I personally do not like keyboard locking rods on a machine at all. Sooner or later they cause trouble – both Linotype and Intertype. The rod on the Linotype slips down a little – just enough to make you miss a few mats but not enough to show you what the trouble is. The Intertype locking rod also works down occasionally, and the flat plate gets in such a position that the weights get hung up against it and you get doubles. If you use any sort of locking rod that locks the weights behind the keyboard, be sure it stays up out of the way when it is supposed to. (More about these under *Cleaning the Keyboard,* page 27.)

Repairing Keyboard Cams

When cams have the teeth worn down, it is best to replace them; also if the journal pin or the hole in the cam are worn excessively, they should be replaced. In putting in new cams and/or pins, use a light touch of the hammer to brad the pin, or you will squeeze the yoke unduly and the cam will bind. If the cam itself is worn, it is usually best to get a new cam and yoke assembled.

On occasion, however, the stop pin only in a cam will be unduly worn. You can replace it with care. The danger again is that you will squeeze the sides of the cam together. If so, they will bind on the tooth of the stop strip. Take a six-point liner and thin it down on a grindstone or with a file until it will just slide in between the two halves of the cam. In the middle of the thinned-out place, cut a notch with a hacksaw about ¼" deep. Make the notch wide enough to go around the stop pin. When you knock the old pin out, have your filler-piece in place to save distortion of the sides. Lay the cam itself flat on a metal surface – preferably a block with a small hole in it. Knock the pin

out with a small punch. Put the new pin in place, lay the cam down on the metal, with the filler-piece in place again, and brad the stop pin. Don't be rough; those cams are made of brass and not designed to stand up under much pounding.

Replacing Stop Strips

If you apply a new stop strip or "comb," be sure the teeth are centered on the cams; leave the screws barely loose; hold a tooth with a pair of duck-bills and work back and forth to determine the best position. (If you let the stop strip slip down into the cam frame, you don't have to take off the frame. Take out two or three cams near the middle and fish it out with a hook.)

Does Leveling Affect The Keyboord?

LOOMIS: This is a question that has been asked many times. The answer is yes. I worked on a Model 19 out in South Dakota; they were having trouble with the first ten or twelve letters; it was cold that day — about 20 below — and they had a fire roaring in the stove. I could see when I walked in that the machine, on an unsupported board floor and with an auxiliary unit on the side, was far from level — between one and two inches off. I got into the keyboard, finally took it off when my fingers thawed out, and found that the weights, thrown to the right side by gravity, had been contacting the key levers only by the corner of the notch, and there were big gouges in the weights almost a quarter of an inch deep. This had not bothered for many years, until finally the key levers began to wear, and then the levers would bind in the gouged-out places.

Haw About Heat and Cold?

LOOMIS: Ordinary summer heat does not seem to affect a keyboard adversely; down in Tulsa it used to get up to 113° at night, and it was almost as bad in Omaha — but the keyboards ran well. Cold is another story. In a country shop it is often necessary to build a fire a couple of hours before you start on the machine; and on the old *Minneapolis Journal* even a mildly frosty morning in the early fall would make the keyboards sluggish.

Why Daes Most Trouble Occur on the Bock Cam Frome?

LOOMIS: It is my theory that the heat radiated by the motor and often by the electric controls dries out the cams and the rubber roll to make trouble. I have long thought of making an asbestos shield for the machines in the shop, to test that theory, but I haven't gotten to it. If it is true, something could be done about it. (Note that this continuous radiation is different from a few hours of hot weather.)

RUBBER ROLLS

What Is the Best Way to Install Rubber Rolls?

QUESTION in *The Graphic Arts Monthly:* By the time we have stripped the old rolls from the cores and have the new ones in place, everybody in the shop has blistered hands. Is there any easy way to perform this operation? — N. C., New Washington, Ohio.

H. C. ROCKWELL: Some start the roll on the shaft and fill it with water, then push it on, but a rusty core results. Compression of air is usually most satisfactory. One operator put on the end of the roll a clamp to which he attached a bicycle pump, and a few strokes would slip it in place. There are other compressed air devices.

The shaft must be well prepared. Polish with emery cloth; rub with graphite. One way is to start the roll on, holding the palm or the thumb over the end to compress the air, and push it down quickly.

HARDING: Many rubber roll shafts have oil rings which must be removed. The first Linotype ring is in three pieces. You insert a sharp instrument between the two rings and pry off the cap or outside ring. Drive out the taper pin or straight pin, and the second ring may be slipped off. Some look the same but are in one piece; pry or drive off. Intertypes have a steel wire ring that must be pried off. Some oil rings are eccentric; these are knurled, and you turn them anti-clockwise to remove.

If the rubber roll becomes stuck half-way on, insert a slender screwdriver between the roll and the shaft and dust in a little graphite. Always push the roll, either off or on. Pulling stretches it and makes it tighter.

When rolls only are removed for cleaning, leaving the cam frames on the machine, wipe out the hole in the bracket before inserting the rubber roll to avoid getting oil on the roll. Rolls should be cleaned with soap and water when they become hard or glazed.

The removal of some rubber rolls may appear very awkward because of the auxiliary keyboard which appears to stand in their way, but it will be noticed on these machines that the bolt in the cam frame bracket, through which an oil hole passes to lubricate the roll bearing, can be removed and the roll shaft can be moved about two inches to the right, tipped down, and withdrawn without the necessity of pulling out at the right of the keyboard.

LOOMIS: Mr. Rockwell's answer is a graphic demonstration of changing conditions. It was written in 1937, before the advent of synthetic or plastic rolls, so I can sympathize with him on the use of water, for I never liked it myself. Years ago I got a piece of metal tubing that would slip over a roll, and welded a length of 1¼" brass rod onto it, then bored out the brass to fit over the small end of the shaft. Onto the brass I welded an automobile valve. This gadget worked wonderfully for many years, with assistance from filling stations. But the war came, and presently we had a new kind of rubber roll. Whether it was plastic or just synthetic I don't know, but it was the stickiest material ever made for keyboard cam rolls. It worked wonderfully, but the rolls were next to impossible to get on. On a Saturday afternoon in River Falls, Wis., I attempted it first. Graphite didn't help at all. I tried the compressed air at the truck station next door — 200 pounds pressure. No good. The rolls stuck two thirds of the way down, and every man in the shop had blistered hands within a couple of hours. Those rolls were immovable.

If I had not ruined the old rolls taking them off (I always use a sharp knife and slit them to remove them) I would have put them back on. But the trout weren't biting that afternoon in the Kinnikinnick, and presently the floorman wandered in. He took two pieces of ten-em wood furniture, put one on each side against the end of the roll, and, holding the shaft against the floor, pushed slowly but steadily. In ten or fifteen minutes he had them on. This is worth remembering.

I had another call to make on Sunday, and I was worried. They had ordered the same kind of rolls, and I thought it would be best to forget changing them. But when I got there, the operator, an old-timer, said, "I put the rubber rolls on for you." I said, "*You what?* And how?" "I used water," he said, "same as I have done for forty years." So water is the answer. Yes, it rusts. I don't like that, but I can't help it. All rolls today are stickier than they used to be. The next time I'll try gasoline, maybe, to avoid rust — but gasoline burns, remember. Get out in the open, away from all fires, if you try this, for when the pressure gets built up, the stuff will squirt out from under your thumb.

The main thing to remember with rolls is: push and twist. I have used Harding's method of getting graphite into ordinary rolls that stick half-way, and in an extreme case I suggest you remember the stunt with furniture.

Corrugated Rolls

Corrugated rolls have much to offer. They grab better, and the corrugations don't wear very fast. Also they measure a little bigger over all, and for that reason are good to take up the slack in worn parts on old machines. But don't try them on all Intertypes! A good many Intertypes, especially later ones, won't take them. There's not enough clearance for the cams to turn over.

Creeping Rolls

Occasionally a roll will creep away from the end of the shaft and leave an *e* or a *t* or a spaceband or dash high and dry. To some extent this depends on the roll itself – but I never glue them as some do. Graphite or talcum powder, of course, accelerates such creeping. However, I have often used graphite without trouble. My system is this: I push the roll down hard against the far end; then I turn the shaft over and push the other end of the roll about half an inch over the open end. Then I back up both ends by pushing. In other words, when you are through, the roll is stretched a little in the middle and bunched a little at the ends – but not, I hasten to say, enough to be seen with the eye. I imagine you'd have to measure it with a micrometer. As far as I know, a roll put on this way has never crept.

WARNING: If your roll shaft has a gear on the driving end, it is safer to remove the gear before installing a roll. There's only a set screw holding it, and the gear always fits easily. I have, in the heat of installation, broken those cast iron gears by slamming them against something.

Rubber Rolls Can Be Patched

In case a short section of roll is badly grooved, if you have no new roll you can cut away the bad section with a sharp knife. If on the end, cut a section of equal length from the good part of an old roll, and push into place. If in the middle, push one end to the middle and put the new piece on the end. If one particular letter is deeply grooved, loosen the keyrod spring or the overthrow spring on the cam yoke plunger.

CHAPTER II

CLEANING THE KEYBOARD, KEYBOARD CAMS, MAGAZINE, MATS, KEYRODS, AND VERGE RACK

Cleaning Keyboards

QUESTION: How often should a keyboard be thoroughly cleaned, and how do you go about it? — A. P. S., Rifle, Colo.

HARDING: My friend, you really have asked a question. It's a question asked by a lot of operators, and so I am going to try to set down a complete answer. Every keyboard should be taken apart and cleaned thoroughly every two or three years, according to how much dirt sifts in on it. The first thing to do is take the keyboard off of the machine. There are quite a number of different ways to do that, but we'll take them one at a time.

First, in removing any keyboard, throw off the keyboard belt, take off the copy hooks, remove the copy board, copy tray, sorts tray, and cam frame covers; disconnect the assembling elevator and take off the counter-balance spring. Remove the hex-head bolt between and above the rubber roll shafts at the right side of the keyboard.

Make a copy of the keyboard layout if you do not have one. Those keys have a way of looking very unfamiliar when you start putting them back.

Also, mark the cam frames on the outer ends, front and back, before you remove them. It is a good idea to take a three-cornered file and make one nick on the edge of the right end-piece of the front frame, two nicks on the back. This will save much time later.

I will outline specific directions for some representative types. An m-o will recognize the variations in his own keyboard (and there are many) and will be able to take it from there.

WARNING: It is important on all models and on all guides such as key-rod guides upper and lower, keybar guides upper and lower, and all other guides, to note if there are any extra unused slots at either end. If there are, it is well to mark these with a small cut on the outer edge from a three-cornered file. Do this before removing. It will save a lot of time, and sometimes two or three assembling jobs.

The number of slots varies; some machines have ninety, some ninety-one, some of the swinging keyboards ninety-two. About 1 a. m., when you're trying to put the thing back together, it's confusing.

REMOVING KEYBOARDS

To Remove Keyboord from Models 1, 3, ond 5

1. See that all keyrods and other parts are at rest or not in the course of a movement.

2. Lock the verges by inserting a locking wire above the shoulders of the verge pawls. The best wire is a flat one, made for the purpose. If a round wire is used, it should be a little larger than the regular keyboard cam-wire. The wire has been properly inserted if matrices are not released when the keyrods are raised by hand. The Models 3 and 5 verges are locked by turning the crank of the verge locking bar, located between the magazine and the verges, right side. In case of the Model 5, lock the matrices in the magazine or remove the magazine entirely.

3. Remove the cam frames. A screw at either end of each cam-frame. Nothing to lock.

4. Remove the screws from the two bars that carry the keyrod spring-hooks. The keyrods will now dangle, supported only by their notches where they engage the verges. The lower keyrod guide and the spring-hook plate will be supported by the keyrod springs.

5. Now be careful. We are about to separate the keyboard posts from between those two spring-hook bars. If the keyrods are jostled unduly, some of them may twist and slip off the verges. Use a socket-wrench to loosen the two large bolts that hold the keyboard from underneath. Sit with the knees under the keyboard, remove the bolts, and withdraw the keyboard very carefully by tilting the front up to allow the guide-posts to move down and out from between the keyrod spring-hook bars. Take the keyboard to the work bench.

To Remove the First Style 8 ond 14 Keyboords

Here the keybars do not yet come off in a frame, and it is advisable to dismantle the keyboard without removing the cast iron frame of the keyboard from the machine.

1. Loosen the screws that hold the keyboard pulley gear-guard. Remove the large screws at either end of the cam frames, and remove both cam frames.

2. Cut a stick about ½ x ½ x exactly 15¼ inches. Tie a tough cord to each end, and tie it securely to the back of the keybars by bringing the cord through the slots in the back of the keyboard and around the keylevers at the front. Twist the cord around the lugs on the keyboard frame; bring one over on top, the other below. Be sure to do a good job. This is to hold the keybars or weights in place when you remove the banking bar. Raise the keybars by inserting 6-point shims under the keybar guard, T-254, or H-332, that rests under them. The late Linotypes do not have the guard.

3. Remove the banking-bar and keyboard lock.

4. The keyboard can now be removed by taking out the four screws at the front, under the assembling elevator lever shaft, and the two screws directly

under the rubber roll bearings. Pry the keyboard off the dowels at the back, and remove the keyboard and key-bars from the cast-iron base.

Clean the parts.

Reverse operations when assembling.

To Remove "Old Style" (Second Model) 8 and 14 Keyboards

This keyboard is locked at the front and the machine is equipped with keybars that are removed in a fixture.

1. Loosen the gear guard and remove the back cam frame.

2. Lock the keyboard in front, under the assembling elevator shaft.

3. Holding the keybar bracket at the rear of the keyboard, remove the flat head screws that go through the keyboard posts one inch under the rubber roll bearing — one screw at either end. If the keybar bracket does not come off by removing the two keybar bracket screws at the front, look for two screws that hold the bracket at the back.

4. Remove the front cam frame.

5. Leave the keyboard on the machine, but remove the assembling elevator lever shaft, the fulcrum rods, and the keylevers.

6. The skeleton of the keyboard can now be removed by removing the four screws at the front, under the assembling elevator lever shaft, the keyboard lock screw, and the two screws directly under the front rubber roll bearings.

The slotted plate that slides to lock the keyboard may be taken off by removing the two screws on which the plate slides. There are lock nuts on these shoulder screws.

To Remove the Linotype Swinging Keyboard

1. See that all the keyboard cams are in place and that no keyrods are elevated.

2. Lock the keyboard.

3. Raise the spring latch at the back of the assembling elevator lever and disconnect the lever from the assembling elevator link. Raise the assembling elevator handle. This will latch the assembling elevator down in normal position. (But watch it; they don't always hold.)

4. Turn the magazine shift lever to the highest point. This lever has a clutch that will allow it to disengage and move to the upper position without moving the magazines from operating position.

5. Unscrew the long, knurled-head screw under the left side of the keyboard and swing the keyboard out to the right.

6. Loosen the set screw that holds the large bolt under the right side of the keyboard — the bolt on which the keyboard pivots. Sit with the knees under the keyboard, remove the large pivot bolt and lift off the keyboard. (Most swinging keyboard work can be done without this last step.)

To Remove Intertype Keyboard, Model A, B, C

1. Lower the magazines to the lowest position and open the channel entrance, trip the dog from under the magazine cradle, and tilt back the magazines.

2. On the old style Intertypes, remove the upper keyrod guide strip from behind the keyrods. Remove the keyrods, one at a time, and lay them on edge in a galley, in their respective order. Do not get them mixed because they may not work properly if transposed.

If the machine is new style, mark the position of the keyrod frame, remove the screw on either end of the keyrod upper guide, lift out the keyrods in one unit, and lay them aside. The position of the keyrod frame should be marked before it is removed to insure returning it to exact position. Failure to do so may allow some of the keyrods to miss the verges.

3. Remove both the front and back cam frames.

CAUTION: On old style Intertypes, when you clean and oil the cams only, remove only one cam frame at a time, and replace it before removing the other. There is no keyrod frame here, and the lower keyrod guide fits into the cam frames. When both frames are removed at the same time, this guide will sag and prevent replacing the cam frames until all keyrods have been removed.

4. Drive out the taper pin from the assembling elevator lever handle and remove the shaft.

5. Use socket-wrench to loosen the two keyboard base screws, underneath the keyboard, rear left-hand corner. After loosening the screws, sit with the knees under the keyboard and remove the screws. Lift off the keyboard and take it to the work bench.

Dismantling the Keyboard

Now, with the keyboard off and fairly intact, and with your copy of the keyboard layout made, you are ready to take the thing apart. Fun, isn't it?

If there is a spring attached to the spaceband key lever, disconnect it and save it. Take out the spaceband key lever.

Remove the fulcrum rods and withdraw the key lever from the entire keyboard.

Now turn the back of the keyboard toward you and prop it up with a pig of metal under either end. Remove the banking bar and the keyboard lock, or the stick that you tied on in place of the banking bar. Remove the spring from the spaceband keybar (or weight) and tie a string to that keybar for identification. Lift out all the keybars. It saves a little time to keep them in order, especially on older machines where there are six different kinds, but it isn't essential.

If not already done, remove the skeleton of the keyboard by taking out the four screws at the front edge under the assembling elevator lever shaft, also the keyboard lock if it is in front, and the two larger screws directly under the front rubber roll bearings.

Cleaning the Keyboard

First we shall clean the keyboard itself. Later we'll tackle the keyboard cams.

1. Wash all parts in high-test gasoline (never leaded), and be careful of solvents. Wash the key levers (metal part only), weights, the banking bar, the keyboard plate — anything that has oil or dirt on it. Wash the keybuttons, using soap and water or an ammonia solution.

2. Watch for burrs and worn spots. File off burrs and rub graphite into the parts. Ream out the holes in the key levers with a pointed stick.

You can safely rub all parts with dry graphite where they rub against something else.

LOOMIS: You're doing fine so far. The only addition I have to make is the use of that much-worn thin warding file to clean the sides of the slots in the top plate and the back plate of the keyboard, where the key levers go through. This should be done with a light touch, for the idea is not to file out the slot but to clean out the dirt. A 1 or 2-point brass rule with a piece of emery cloth around it will do if you haven't the thin file (those thin files are sometimes hard to find).

On machines where the keybuttons have never been washed — or at least not for many years — I have been unable to get the buttons clean with anything but a strong solution of yellow lye soap that is used by janitors in mopping floors in public hallways. I have been unable to get a generic technical description of this soap, but it is a grease solvent, and can be bought from the National Soap and Chemical Co., 110 Fifth Ave., S. E., Minneapolis, as Nasco D. N. Cleaner. I use hot water and a small brush, dipping the button frequently. You can count on losing ten or twelve letters in the process, for the letters are formed by celluloid inserts that will come loose. Milton Anderson does very well with Bab-O and a pad of steel wool.

Assembling the Keyboard

HARDING: 1. If the keyboard locks from the front, put the slotted plate in place; two screws and a spring. Put in the lower row of key levers (the levers having the keybuttons — not the keybars).

2. Insert the fulcrum rod. If one end is notched insert from right to left, notch to the right. (Late Intertypes require the notch to the left.) After you get the rod through the second partition, it will be easier.

3. Insert the next row of key levers and so on, until all key levers are in place. The keybar guard, T-254, or H-332, that rests under the keybars, should be put in place before the keybars are put in (but may be put in afterward by cutting into short lengths.)

4. Insert the small bar in the fulcrum notches at the right or left of the keyboard and replace the screws that hold the bar.

5. Turn the back of the keyboard toward you and prop it up about two inches off the bench.

6. Set the spaceband keybar aside. Assemble the keybars in sets of six as indicated by the notches on their front sides and set the keybars in place, starting with the lower-case *e*. The lower keybars will bind just a little as they go into the lower keybar slots. Pressing down on the lower keylevers will help. The spaceband keybar goes on last and usually requires a spring. If there is no hole in the keybar for the spring, look for a screw or stud on the key lever. In this case the spring is fastened at the right side of the keyboard.

7. Put on the spaceband keybar spring referred to in the preceding paragraph.

8. With the thumbs, hold the banking bar in place, under the notches on the keybars. Have the banking bar screws handy. Place the fingers under the keybar guard which is under the keybars, and push up as you push the banking bar onto its dowels. This will raise all keybars. If the keybars are not raised, the banking bar will not slip into place. This applies to Intertypes and old Linotypes. Linotypes with keyboards that lock at the front do not have the keybar guard, H-332.

8. In case of the old style keyboard lock, put on the locking bar. Notice that the thick washers are put on with the flat side up. The thick washers go in place first, then the locking bar, and finally the thin washers and screws. Do not let the shoulder screws catch on the washers.

10. Try out the keyboard thoroughly before putting on the cam frames. This is the time to determine if all keylevers and keyrods work properly. As you press the keys, push them to the left and to the right, and straight down to detect any tendency for double response. All weights should drop promptly.

When replacing the two bolts that hold the keyboard at the bottom and the one at the right side, do not tighten one bolt until all three have been started in place. This direction applies in many cases where bolts and screws are to be inserted.

If the assembling elevator lever counterbalance spring is replaced with the solid loop to the front, the hook cannot tear the operator's clothes.

Loomis: I find it easier to insert the fulcrum rod from the left, handling the key levers with my right. If the keyboard is on the machine, you may have to lower the vise. But some keyboards have the keepers on the right, and in such a case you have to work from the right to avoid using the notched end as a leading end — which won't work very well.

The Book says this cleaning should be done once a year, but unless your shop is a bad dirt-trap, once every two or three years will do pretty well if you flush out the keybars and keyrod guide occasionally when the cam frames are off.

THE KEYBOARD CAMS

Cleaning the Keybaard Cams

HARDING: You can remove any cam frame one at a time for cleaning, but in this case we have them off already.

1. Remove the cams separately and place in a pan of naphtha or high-test gasoline. Use a shallow tin cake pan. Personally, I mix the cams to distribute the wear, but the novice may get along a lot better if he keeps them in order. Tie a string on the spaceband cam.

2. Use a brush to wash the cams; clean the free end of the yoke, the other end also, and the teeth. If there is a hard gum on the periphery, scrape it off.

3. Spread the cams out to dry. A fan or open window will help.

4. Loosen the small headless screw that holds the rubber roll bushing and remove the roll. Sandpaper the roll with medium sandpaper. Work until all marks have been removed from the roll. Then wash it with soap and water. The roll should have a "tacky" feel, like live rubber.

Wind a cloth tightly around the bushing to keep water out of the bearing.

5. Hold the cam frame over the gasoline pan and wash it thoroughly, paying particular attention to the ends of the cam frames, the triggers, the slots in the cam frames, and the stop pins; if any triggers appear to bind, remove the trigger wire and look for kinks in the wire. Polish the wire. If any cam stop strip pins have depressions where the cams have been striking, file away these depressions or put on a new stop strip. See that the cams do not rub on the stop strip pins.

Insert a probe in the oil holes in cam roll shaft bushings and cam frame.

6. Oil the bearings of the rubber roll shaft and replace it.

Be sure that the oil hole in the bushing is lined up with the oil hole in the bracket.

Do not set the small, headless screws tightly against the bushings. To do so may throw the roll shaft out of line and cause it to bind.

The cam pivot wire should always be removed, straightened, and polished with graphite.

If a cam is worn so that it tips and rubs on the yoke, replace the journal, the cam and journal, or the whole cam, assembled.

File all burrs from the free ends of cam yokes.

7. When certain that all gasoline has dried from the cam pivots, oil them very sparingly, using clock oil and a broom straw or piece of wire. Wipe off

any surplus oil after spinning the cam. Replace the cams, being careful not to place them wrong side up.

8. Lock the triggers through the upper holes, using an extra cam wire. If you cannot push cam and trigger wires with your fingers, there is something wrong. Be sure to push the wire out to the right as far as it will go without releasing the lefthand trigger. This will facilitate pulling out the wire after the cam frame has been replaced.

9. Replace the cam frames. Careful now; simple as this operation is to the experienced man, it presents many problems to the beginner. Observe the following:

a. See that all triggers are locked.

b. See that all cams are turned to normal position (turn the rubber rolls) and that they stay in position.

c. See that no keybars are elevated. Keep your arms and sleeves off the keyboard keys.

d. Do not tighten the screws in the ends of the brackets. Leave the brackets as you find them.

e. Be sure the cam frame is all the way on the dowels before tightening the large cam frame screws. If it feels "springy," do not force the screws in. It should click into place. If it does not, the following may be out of place:

1, a trigger; 2, a cam; 3, a keybar. Back the screws out. Take off the frame and have a look. Any one of the above parts out of place will cause a kink in a cam or trigger wire when the cam frame screws are tightened. (Also see page 251.)

Tighten the cam frame screws. Pull out the trigger locking wire. Test every key twice, including the spaceband.

Loomis: Mr. Harding has given an outline of cam-cleaning in the traditional manner, and it belongs in here because most people clean cams that way, and The Book advises it. However, in the course of several years of maintenance work on the old *Minneapolis Journal,* where Bob Ritten (now Intertype representative in Minnesota) and I cleaned keyboards for piecework operators as often as every four weeks, we did some experimenting and came up with some different conclusions.

In the first place, we determined by taking cams apart that even the very highest test gasoline could not be removed or dried from the pivots by any ordinary means of heat or compressed air. We found that even after two or three hours of varied treatment, we could take a cam apart and still find oily liquid on the pivot. So I do not wash them in anything. Carbon tetrachloride

might dry in the pivots, but it has a curious viscous effect on steel. So I use a small brush and clean out the dirt all the way around, clean out the teeth of the cam, scrape the gum off the edge. Use an eraser and polish both sides of both ends of the yoke.

On principle I usually spread the hook at the fixed end just a little unless they have been spread before. I always use new cam frame wires. On machines with overmotion springs, I put a drop of oil on the springs.

Take that same thin warding file (by now it's getting worn about right) and clean out the slots where the free ends of the cam yoke work up and down in the cam frames. Again, don't file – just clean and take off burrs.

I remove the triggers, and these I do wash in gasoline. Spread them out and let them dry. These holes are open, and besides, they will not be oiled.

When it comes to oiling the cams, again I am unconventional. I have had good luck using what is commonly called separator oil; I have even used No. 10 oil with fine success. The only reason I can see for clock oil is for machines that will have to start up cold. Maybe oil has improved in the last twenty years. You might try No. 10 on some cams. If it works, it will last a lot longer than clock oil.

We always bent the end of the trigger-locking wire in a right angle so we wouldn't make a mistake and pull the wrong one. It has been done! If you get the hook on the wrong side, never mind. Get hold of it with a pair of pliers and pull it out in a curve.

If you find you've misplaced the weight with a hole in it for the spaceband spring, drill a new hole in the one on the end. Next time, remember.

You can tell the cam frames apart by the number of cams they will hold: the front one 45, the back 46. Most back frames will have a place cut out on the stop strip for the spaceband cam, also. On frames with gears, the one with the pulley is the back one. One good way to tell: the large bearing on the front frame is on the right, on the back frame is on the left. But I have seen some frames that were a little hard to tell apart even with all this.

With this type of dry cleaning of the cams, ordinarily once in six months will suffice. It is not necessary to do the job on the triggers more often than every two or three years.

It is an interesting sidelight to know that I once, many years ago before I dropped the gasoline wash, washed a set of cams in kerosene by mistake. I had a heck of a time getting off the surplus, but those cams ran for a year and a half without additional oil. At that time the machine was moved and I lost track of it. I have, as an experiment, tried this again – purposely. It had a different conclusion. The kerosene dried out thoroughly in two weeks; must have been different stuff. I oiled the cams then with No. 10 and they worked fine and lasted over a year.

THE MAGAZINE

Cleaning the Magazine

HARDING: When you clean the keyboard, naturally you will clean the magazines and mats. As a matter of fact, these latter will need cleaning every six months or a year.

First, run out the mats as soon as you get the keyboard in order, and stack them on galleys. Use the light and see that no mats are sticking in the magazine. Then remove the magazine and place it on the bench.

Remove the escapement cover.

Remove the short pi-tube in some magazines.

Loosen screws, swing back the clamps, and pry out the matrix stop strip rod at the top of the magazine.

If it is an Intertype magazine, prop the shutter open with wood furniture.

If Intertype or Model 15 or any magazine that has self-contained verges, turn it on its back to keep the dirt from running into the verges.

Turn the magazine up and let any remaining mats run out.

Now use a magazine brush in good shape to expel the loose dirt. Push the brush through, pull it out, and turn it occasionally. Watch the channels next to partitions. After brushing, fold a sheet of paper to reflect light into the magazine and look for black spots left in the channels. If spots are found, clean the brush and sprinkle on some high test gas, alcohol or carbon tetrachloride. Low test gas is not to be used; it will leave a film of oil in the magazine. Brush until all spots disappear.

LOOMIS: Here again I've gone astray from the classical methods. Let me tell you a story. Less than a year ago I was called to make a Model 5 work. The owner had moved it and erected it but he could not get mats to drop properly. I asked him if he had cleaned the magazine. "Yes." "What with?" "Type Cleaner." "Who recommended it?" "The salesman; he guaranteed it would not leave anything in the magazine whatever."

We gave her the works for five hours but got nowhere. Finally took off the escapement cover and played with the mats, and discovered there was absolutely nothing holding them. They just didn't slide fast enough. I said, "Go down to the drug store and get a pint of carbon tetrachloride, commercially pure. Don't take anything else – no cleaner, no solvent, no nothing but carbon tetrachloride."

We emptied the magazine, laid it out on a table and stripped it as Harding tells you to. Then we applied my cleaning formula that has not varied for ten years; get a big squirt can and fill it with carbon tet. Squirt it liberally into the magazine. Let it soak a few minutes. Squirt in some more. Use that new brush now for the first time. Work from the wide part at the top. Take one section at a time. Keep the brush wet.

When you get through, let the magazine dry for fifteen minutes. Your brush will dry too. Now go through it with the brush and polish thoroughly. You will discover that carbon tetrachloride not only is practically the only solvent available that will not leave anything, but it also will polish brass until you can hardly bear to look at it in the light. And the polish will stay for a long time.

In the case above, we put the magazine back on, ran the mats in, and held our breath while we tried it. The mats almost tumbled over each other to come down!

WARNING: Do not wash steel or iron parts with this stuff. It does something to ferrous metals — intensifies their frictional qualities, so they don't slide well. On Intertype, Model 15, or any magazine with self-contained verges, turn the magazine upside down before cleaning.

CAUTION: In taking off a Linotype magazine with an automatic lock, push in the lock, then look at the locking strip studs to see that they are down level with the surface of the escapement cover. Automatic locks have been known to release the magazine frame without locking the mats in place.

If there has been trouble with sticky verges, sometimes it helps to dust graphite over the verges and then wash it into them with high test gasoline, or squirt the mixture from an oil can. If on a magazine with self-contained verges, do this before cleaning, and be sure the verges are on top when you clean the magazine.

HARDING: Look down all channels with the light. When all channels are polished, look for bristles. Look from both ends, for a bristle can hide until the mats try to go through. The wire hook that is used to pull out flat mats, is a good device for removing them. You can also use the handle of the magazine brush; some twist a rubber band around it to help. Loomis uses a sharpened piece of hacksaw blade fastened to the end of a steel rod, and cuts them out. Those near the end can be reached with tweezers or fingers.

Brush the escapement cover the same way. If your verge rack is easily removed, take it off, turn it upside down and bump it a few times to shake out the loose dirt. Graphite and gasoline will provide a quick but not very thorough cleaning. (See page 7, *Replacing Verges*, etc., for cleaning instructions.)

Put the magazine back together.

Graphite in Magazines

In 1900 John S. Thompson advised use of graphite on all new mats and magazines, but apparently the composition of the metal has changed since then, for now it is only necessary to clean and polish a new magazine with carbon tetrachloride (no, I do not own any stock in any chemical companies), and clean the bottom ears and toes of mats likewise, or, in case of heavy tarnish, rub the toes and ears with an eraser.

It is not necessary and not desirable to put graphite into a clean magazine, except occasionally an aluminum magazine. In such a case, brush it in thoroughly and do not leave any surplus. Use it for its polishing effect only. If you do use graphite, you will have to clean the magazine more frequently. Under most circumstances, clean mats will run well in a clean magazine without lubrication.

While you are at it, wipe off the distributor screws, the elevator jaws and distributor shifter buffer with gasoline and a rag. Go over the path of the mats through the machine and see that there is no gum or dirt to foul up the mats immediately.

Aluminum Magazines

Loomis: Aluminum bottom plates are not all the same. The companies have used several methods of making them, but all I have seen would not handle small type without a first brushing of graphite. One thing about an aluminum bottom plate: once in use, it does not seem to muck up and slow down the mats as soon as a brass plate. I have run them for two years without cleaning, and at the end of that time, though there was plenty of dust on the lands (which hurts nobody), the grooves themselves seemed as clean as they were at first. I don't guarantee it will be this way on yours. The ones I had might have been a special batch.

Graphite in Magazine on Models 25 and 26

Loomis: The Models 25 and 26 have a peculiar situation. The two magazines are hinged at the top, and the bottom lifts up and down to match the assembler entrance guides or partitions. This means that when the lower magazine is being used, it has less slant than a normal magazine. This small difference sometimes makes a lot of trouble in getting mats through, and sometimes graphite is the only thing that helps. It is better to run a large size in the bottom magazine, but if you must use a small size and have to graphite, do it this way: clean the magazine thoroughly with tetrachloride, then with a separate brush *polish* the magazine with graphite and blow out all loose or surplus graphite.

To Put a Linotype Magazine on a Machine

LOOMIS: In putting a Linotype magazine full of mats on the machine, follow this unvarying procedure: after the magazine is in place and before you drop it to the verge rack, run your fingertips along the two open places just underneath the magazine. Occasionally you will find the toe of the mat sticking down, especially in the far one. Push it back in. A magazine will lock in place with a mat out of place, and when you unlock the mats you will get considerably more than you expect to get. Now for a final check, drop the magazine in place, take the light — this will take only a few seconds and it is a habit that will save many pied magazines over a period of years — look at the magazine on each side and see that the verge rack fits up into the open places. This will get to be automatic, and is the best insurance there is.

THE MATS

Cleoning Solutions

QUESTION: Will you please give the proper method of cleaning mats? Would you advise the use of mat-cleaning solutions? — D. A., Lodi, Calif.

LOOMIS: Cleaning of mats on the sides is seldom necessary unless, from lack of care in keeping oil away from mats, gum accumulates on the side and impedes assembly and justification. This will be noticed when mats fail to sit down properly in the assembling elevator.

When this occurs, cleaning becomes a real question. Cleaning compounds (usually with a chromic acid base) will remove all dirt, but *it is not desirable to remove all dirt.* What is called the sidewall of a mat is very thin; this is the wall alongside the female die of the letter itself. This sidewall inevitably becomes pressed in a little in use, but the resulting small depression is filled with dirt, and you have no hairlines as yet. (I am not speaking of mats used with spacebands that have noticeable accumulations of metal at the casting-point; use a font of mats for a few hours with bands like that, and you may as well accustom yourself to hairlines until you get new mats.)

Now the chromic acid compounds, or *any* substance strong enough to remove dirt from the sides, will also remove it from the sidewalls. For the same reason, a wire brush is questionable. A rubber eraser on toes and ears, front and back, will take off the dirt that impedes motion through the magazine.

New solutions, methods and equipment are constantly being offered. A conservative and even reactionary attitude toward them is desirable. Many fonts of otherwise satisfactory mats have been ruined for practical use by new and easy methods of cleaning.

I do not advise use of any solution or fancy equipment except elbow grease. I use an eraser on toes and ears; recently I have had good success with a rag dampened with carbon tetrachloride with final polishing with an eraser.

I use nothing on the casting side unless there is an accumulation of metal (indicating a loose lockup) which must be removed to prevent uneven height on the press. In that case I line them up in a galley and use the eraser. You will note, if the eraser is held flat on one edge, it will not injure the sidewalls. The index side can be cleaned with an eraser, and this greatly aids visibility.

But solutions I do not like. They roughen the surface of the brass (you can see this with a magnifying glass), and you will never again get them to slide as well as they did before.

What Makes Gum Accumulate on Sides of Mats?

LOOMIS: Some fonts are much worse at this than others. Certain fonts of mats produced during the war were bad — why, I don't know. I suppose it comes from graphite on the bands. It can be removed by rubbing on a piece of strawboard or chipboard on a stone. Use no acids, and perferably no liquid of any sort, except perhaps, if the stuff sticks hard, you can dampen the cardboard with gasoline or carbon tetrachloride.

Cleaning the Mats

HARDING: It is easiest to clean the toes and ears of the mats if you will push a couple of long six-point slugs under a row of mats in a galley. Bevel one end of one slug so it will slide under. These slugs will provide a rest for the main body of the mat, and the toes will not be so uneven.

To remove the dirt, some use an eraser, which is good, but many use a cloth dampened with tetrachloride. It's easier and perhaps works better. If you use an eraser, by all means blow the eraser dust from the mats on both sides; use a fine brush if necessary to get rid of it.

Clean the toes and ears on both sides, and clean the index side. If there is an accumulation of metal below the casting-point on the casting-side, line the mats up together and use an eraser, but not directly in the letters or you will break the sidewalls. If the mats are so dirty on the sides that they must be cleaned (see page 34) rub them on a piece of strawboard or chipboard on a stone. Do not wash them, and use no cleaning solution.

As each galleyful is lined up, look for broken or shaved toes, bent ears.

To turn a galleyful of mats over, place a second galley bottom side up over them, with the open end of the top galley over the closed end of the bottom galley. Holding the galleys together, turn them over neatly.

Now put your magazine on the machine. You can run the mats in through the assembling elevator, set at about 21 picas, or on the second elevator. Either way you will be able to feed them in faster than the machine can handle them.

As for frequency, some m-o's need to clean the mats every three months. Others get by for sometimes a year. It depends on how much dirt gathers, and

how much time you have. If you find mats dropping erratically, try cleaning a few channels. If it helps, clean them all. The last three rows need it oftenest.

HARRY G. POTTLE in *Who's Who in the Composing Room:* Benzine or low test gas should not be used, because they leave a residue. Chromic acid should *never* be used. A safe solution can be made with oakite, a commercial washing powder that contains no substance injurious to mats or hands. Boil the solution, with mats in it, for fifteen minutes. It is easier to make a tray of ¼" galvanized screen, which holds the mats, and which is placed inside the pan. Then the mats can be rinsed with clean hot water. Very old fonts, of course, may develop an unsuspected set of hairlines when cleansed this way. Carbon tetrachloride is a good solution to use in cleaning mats or magazines.

Keep oil and graphite out of the path of the mats, from assembler entrance partitions to distributor entrance channels. If you polish the mold with oil and graphite, cast several blank slugs, then wipe off mold and vise jaws.

Carbon tetrachloride is the best agent for cleaning magazines also.

Hairlines on Mats

QUESTION: What causes hairlines on mats? We got a new font of 8-point a few months ago, and now it is already full of hairlines, as the enclosed clipping shows. The boss is raising particular cain, and I can't say I blame him. — O. T., Belle Fourche, S. D.

HARDING: Hairlines are those annoying fins of metal that appear between characters on a slug and show in print. The causes of hairlines are: accumulation of metal on spacebands, careless handling of matrices, pump stop misadjusted, loose lines, swollen lower front matrix lug which may bind in the elevator front jaw, forward thrust of mold disk pushing against the mats on first justification, face of mold dirty, grooves in mold or elevator head obstructed, nicks in grooves of mold or elevator jaws, screw protruding from mold or elevator head interfering with rise of a band, elevator jaws too close together, back jaw or duplex rail sprung, bent spacebands or mats, a kink in the vise closing lever link, spots of metal on ends of vise jaws, edges of vise jaws rounded, lug on pump lever that stands directly above the pump stop lever may be loose, duplex rail cap loose, wrongly adjusted downstroke of first elevator, so the mats are not free to spread out. The three screws at the left end of the vise, that hold the vise closing lever bracket, may come loose. Cases have been known where the measurement of the spaceband sleeves from the index to the casting side was greater than that of the matrices, thereby holding the mats away from the mold.

Hairlines may appear on bold-face slugs but not on roman, even though the roman is used more than the bold-face. Dirt is transferred from spacebands to the side-walls of the roman characters, building up false walls that make

the matrices actually thicker at the place where the roman characters press against one another in justification. This, of course, separates the bold-face characters and allows metal to flow between them when casting bold-face. The only remedy is to rub the sides of each mat on a tough cloth, spread over a board, or on a piece of chipboard.

Some operators persist in sending in lines without spacebands, especially lines of border matrices. If the vise jaws are not set absolutely right or if matrices are just a little dirty or bent, a line without spacebands cannot justify. If it is necessary to cast a line without spacebands showing, the vise jaws may be opened two or three picas and quads and bands put in on the left end. The jaws may be opened to 30½ on 30-pica measure to allow for a thin space and spaceband.

Besides the above, which will break down the walls of the matrices, the following should be considered: Running the metal too hot over a long period, stepping on matrices, holding your hand under the mouth of the magazine to catch mats as you empty a channel. The cause of hairlines may be determined by the process of elimination, using the above list as a guide.

A false wall is gradually built up on mats. If the matrices are cleaned in a solution — even in high-test gasoline — this false wall will be destroyed and hairlines may result.

Lines must be "air-tight" when the cast takes place. To determine if the justification springs are stiff enough, first see that there is no obstruction to the free spread of the line in justification. Run down a reasonably loose 30-pica line having 20 spacebands. Send in the line and stop the cams on second justification. Slip a button hook through the opening in a band and note how much it can be pulled up. It should not come up over 1 to 1½ picas.

If the side-walls of the matrices are broken down, the font probably is ruined so far as high class work is concerned, but for the country publisher, this is pretty hard to take, because mats are expensive.

If the hairlines are there beyond mistake, use a stiff scrubbing brush or a fine wire brush on the forms after they have been justified, brushing up and down the length of the column and keeping away from halftones. Some have tried planing the form with a rubber heel with good results, but this, of course, will tend to round the serifs on foundry type.

Experiments have been run by rubbing a very slight amount of laundry soap on the sleeves of the bands at the casting point after graphiting. This done over a long period tends to build up false walls on the matrices more rapidly.

We are admonished to clean the spacebands once for each eight-hour shift. It is assumed that there is a full set of twenty-five or more bands in use. If the

machine has only 15 bands or if the walls of the matrices are not good, it stands to reason that the bands should be cleaned more often.

LOOMIS: Back in the nineties hairlines were called "burrs" or "whiskers." In 1900, John S. Thompson in *The Inland Printer* said "hot metal causes whiskers." He mentioned that blue ointment was used on hairlines, but said he had "no faith in soap or other preparations," and in November he went humorous by saying that "when a set begins to show a few whiskers it is only a question of a short time when they will develop a full beard."

The problems of hairlines are still with us. Most of them are caused by one or both of two things: 1, sloppy justification on the part of the operator; 2, improper care of bands.

In the first instance, the operator may have fallen into the habit of sending in lines on the borderline of justification — i.e., loose lines. He should not fudge on this. If there is any doubt, drop some thin spaces alongside the bands. Also, check carefully your pot pump lever stop lever (don't be envious; I'm sitting here with a parts book at my elbow, looking up the names). This is covered fully in *The Pump Stop,* page 117.

On an old font, use of a cleaning solution may have caused hairlines to appear.

In rare cases, difficulty in vise-closing will assist hairlines. This is covered in Chapter XII, *Justification,* page 122. Here too I have seen a dry main camshaft bearing cause the same trouble.

Watch your bands; if they show an actual accumulation of metal at casting-point (anything more than a dark spot), see *Cleaning the Bands,* page 95.

Finally: Quit sending in those loose lines.

I note what Harding says about soap — others say it too — but my impression is that it can be only temporary. You may as well make up your mind eventually to buying new mats — and this time get a new set of spacebands along with the mats. It's cheaper. Take care of the bands, check over the pump stop — and remember, mats today are worth almost a third of a dollar.

Many authorities, however, suggest the use of soap, bees wax, or resin-containing soap. It creates other complications, but it will partially salvage a hairlined font.

I have been asked, "What is a hairline?" The answer is not too complicated. On each side of the female die in each matrix is a sidewall to hold in the metal. It is made very thin to obviate unsightly space between letters. If at any time the mats are not locked up tightly, metal will be forced between letters and will slightly bend in the sidewall. The next time this mat is presented to the casting mechanism, the metal has a slight opening, which presently is enlarged. Eventually the metal, casting always against the same point on the

spaceband sleeve, accumulates on the spaceband. This in turn crushes the sidewall of every mat against which it locks up.

When mats are not too bad, a little careful weeding will clean up a font. Run out all of one letter. Hold them with the casting side toward you and riffle them so all the right-hand sides show up, and examine the light-face positions. An old mat will show discoloration around the casting-point, but a hairline mat will show a fresher discoloration as a rule — a small quarter-moon of fresh lead color. If there is only one, you can often see a nick in the sidewall. If you cannot pick them out, cast them all together several times, then take them off the bar and keep them in order. Lock up the slugs and take a press proof on enameled paper; then pick out every pair between which a hairline shows and examine them. Sometimes you won't catch them even this way, but if you keep your eyes open, you will catch them sooner or later. When you get one, twist off the toe, and it will be gone for keeps.

HARDING: When bold-face or italic hairlines show up but not roman, it may be found that oil and graphite have been used too freely around the path of the matrices.

On old fonts, hairlines may appear on bold-face or italic but not on roman, because the roman is used more and has built up false sidewalls, which project a little and hold the bold-face letters apart.

H. R. FREUND, chief engineer of the Intertype Corporation, in *Who's Who in the Composing Room:* Primarily, hairlines are caused by improper justification. Be sure that:

1. Vise jaws are ground accurately, with a slight opening at the bottom and back;

2. Spacebands are thicker at the casting edge, and are parallel from top to bottom;

3. Spacebands and vise jaws are kept free from metal accumulations;

4. Matrices are free from distortions and foreign substances.

Type metal sometimes deteriorates and becomes prone to adhere to every surface.

Hairlines Suddenly Appear on an Intertype

HARDING: Earlier Intertypes were equipped with a large cotter pin hanging from the vise by a chain. When recasting with a Linotype border block, this pin was inserted in a hole in the right-hand justification rod. Often it has been forgotten, and lines that are only a little short will hairline badly because the spacebands cannot spread the line.

Rebuilding Mats

QUESTION: I have received some advertising from people who say they can rebuild old mats. Do you think this will be satisfactory? After all, there's a lot of difference between three cents and thirty-one cents. — H. B., Hanska, Minn.

LOOMIS: I know how you feel. It wasn't so bad in 1900, when mats were $40 a "set," but nowadays that three cents a mat is tempting. I'll give you the same answer I've been giving owners for a good many years: I have not yet seen a satisfactory job of "rebuilding" mats, but there may be one. Send in fifty or a hundred and try them out. Include a bunch of lower case *o's* to check alignment. As far as I have seen, no rebuilder of mats promises anything for hairlined mats, though some do say they can rebuild the chewed off toes, etc. But in all cases that have come under my knowledge, the rebuilders have returned as unsuitable all mats with toes broken off, combinations chewed up, etc. They seem to have taken mostly those mats with toes worn short and to have swaged them out, dressed them off, and sent them back. The toes are a little thinner, but it wouldn't be so bad if they would restore the original alignment. So it adds up to the fact that you have to have pretty fair mats to begin with, and, if you do, they will make them run through the machine — but don't be fussy about the printing you do from them.

Mats With Worn Toes

A new matrix measures .750" across the toes; when it is worn or damaged to less than .730", discard it. In distribution the short toe will frequently climb upon the land between the channels and cause a stop; in the bottom of the magazine it may do the same thing when it comes up against the escapement pawls.

Mats Out of Alignment

A very few mats out of alignment can make an entire font look bad; they show up more in the bold face or italic than in the roman. But they are easy to pick out of the font. Those that show high on the line will have the bottom edge of the toe shaved off on the casting-side; those that show low have the top edge shaved off of the same toe. The first one is the result of tight lines. The second one may be from tight lines or from misadjustment of the first elevator's down stroke. Run in a line of mats without bands; let the first elevator come to rest on the vise cap; let the mold disk come forward until the toes of the mats are in the groove on the mold; you should be able to raise the first elevator now and show a definite play of .005" to .010" between the first elevator banking screw (next to the jaw) and the vise cap. If this screw is too far down, the mats will be too high, and the mold may shave the tops of the toes. Then you will have a lot of mats out of alignment.

THE KEYRODS

Removing Keyrods

QUESTION: I can see that our keyrods are very dirty, and I would like to clean them while I am cleaning the keyboard. Can you tell me how to go about it? — W. W., Harrisburg, Tex.

HARDING: Usually there is dirt in the keyrod guide at the bottom, and this can be pretty well flushed out with gasoline if you are careful, but if you want to do a real job, and especially if the upper ends have accumulated that peculiar gummy grease that hampers movement, this is the answer.

This operation is very easily done on some machines, while on others it presents quite a problem. First, compose yourself. Don't be in a hurry. It is a job that requires care and patience. It is worth the effort, however, in your personal satisfaction in a job well done, and also in the improved performance of your keyboard.

To Remove Models 1 and 3 Keyrods

Remove the magazine. Then remove all of the keyrod springs, disconnect the spaceband keyrod, hold down on the upper guide plate and swing it forward slightly. Now lift out the keyrods one or two at a time, starting at the right, and lay them edge-wise on galleys, keeping the spring hooks up and jogging them a bit to economize space. Notice that the keyrods are numbered. They are all different lengths, because the keyboard is wider than the magazine. The lower-case *p* keyrod, No. 18, is the shortest because it stands perpendicular. Notice that there are 91 slots in the upper keyrod guide and 91 slots in the lower, yet the spaceband keyrod does not use the upper guide. The extra opening in the upper guide is for the extra lower-case *e* channel. If there is but one lower-case *e* keyrod, notice which verge it operates, and return it to its proper place, which is usually the second slot.

To Remove Model 5 Keyrods

Directions for the removal of Model 5 keyrods are the same as for Model 3, except some machinists prefer to remove the verge plate and face plate.

To Remove Models 8 and 14 Keyrods

Here too the actual removal of keyrods is easier with the face plate removed, although the professional generally does it the hard way.

To Remove Keyrods from Old Style Intertype

Shift the magazines to bring the top magazine into typesetting position, open the channel entrance, trip the dog under the cradle, and swing back the magazines. Remove the screw from each end of the bar behind the keyrods at the top. Lift off the bar and remove any or all keyrods. They are all the same length, but it will be wise to keep them in order. Do not lose the over-motion springs.

To Remove Keyrods from New Style Intertype

Mark the position of the keyrod frame, because all the keyrods will be lifted out in a unit and, when replaced, must be left in the original position laterally. If shifted a little to one side, some of the keyrods may miss the verges.

Disconnect and remove the spaceband keyrod.

When the screw at either end of the keyrod frame is removed, the whole set of rods may be lifted out in a unit. The screws are at the left and right of the upper ends of the lower-case *e* and the em dash keyrods. If the machine is equipped with the twin *e* attachment, that must be watched.

Cleaning the Keyrods

LOOMIS: Both upper and lower keyrod guide plates should be examined. If some of the slots are badly worn, make a note to order a new guide plate.

The keyrods may be washed in gasoline, and the parts that rub against the guide may be graphited, or the keyrods may be buffed with a fine-wire power brush. On some keyrods, however, this will peel off a thin plating, so use caution. A third way is to wash them with the same soap that you may have used on the key-buttons. Use an old boiler or any vessel long enough to hold the keyrods. It doesn't have to be over three inches deep. Use hot water; dissolve the soap thoroughly. Drop the keyrods in a few at a time. Better not dip your hands in. Let the keyrods stay for ten or fifteen minutes. (If you leave them longer they will start to rust.) Then fish one end of a rod out and finish the job with a brush that you can use without dipping your hands in the water. This stuff will do a real job if you have the right soap.

If you do not remove the keyrods, use a squirt can and white gasoline and thoroughly flush out the guides — lower one especially. The cam frames, of course, must be off.

Replacing the Keyrods

HARDING: It is always best to start inserting the keyrods at the left.

If a lower slot is missed, it is an easy matter to raise each keyrod and move it over one slot, but if an upper slot is missed, all keyrods must be removed again.

After the keyrods have been connected to the verges, check to see that the keyrods at the left are engaged with the verges, as well as those on the right. Now pull out the verge and keyboard locks. If some of the keyrods remain elevated a little, bring all keyboard cams to place by hand. Push up on the mats in the magazine. Some of them may be part-way over the verges. Raise the offending keyrods by hand, and let the mats drop. If these measures fail, the keyrod spring is weak or the verge spring is too strong.

LOOMIS: Many persons do not remove the face plate from Models 5, 8, or 14. In this case it requires a little extra patience, ability to twist the hands and arms and neck in coordination, and a touch that allows you to bend the keyrods for insertion without putting a permanent wave in them. Some work from the front, some from the back. Cut a 1" square stick 15¼" long. Drill a hole through each end and wire it to the keyboard posts. (The keyboard is on, of course, but the cam frames are not.) Loosen the keyrod lower guide plate just enough to allow you to work the keyrods in past the keyrod lifting bar by a very little bending and twisting. Do not bend or twist enough to put a permanent set in the keyrod. Most persons find it works best to come up from below, get the top end of the keyrod in the upper guide, and then (with the magazine out of the way) raise the keyrod still farther until they can get the bottom end in the guide. The bottom end comes to rest on the wood. When all are in place – the last few are the hardest – see that all are supported by the keyrod lifting bar or its equivalent; tighten the lower guide. If all keyrods are in place and move freely, you can remove the wooden block.

The Goosenecks

LOOMIS: Try as we may, we can no longer avoid the escapement levers, or goosenecks. Some prefer to take out the four screws and remove the entire assembly; if you do, be sure to mark the first slot in the guide if it is empty, and in returning the goosenecks, start the lower case *e* in first; put a screw in the bracket loosely on that side, and, using that screw as a fulcrum, insert the gooseneck tips one at a time in the guide, and keep swinging the assembly in closer to its proper position.

For my part, I have decided it is easier to take out the goosenecks one at a time by removing the hinge rod. This is particularly true if you have reversible joints in your wrists and elbows – which I have not.

Many words can be given on replacing the goosenecks. Many words *have* been given – some profane. First, by all means keep them in order. Second.

polish the hinge rod. Third, polish the lower and upper ends of the gooseneck. Fourth, it won't hurt to give the channels at the bottom end a touch of a thin warding file (an old one that doesn't cut much) to remove burrs. Fifth, you may have to bend the teeth of the escapement lever guide slightly to make them clear. Sixth, the goosenecks themselves mysteriously or otherwise turn up bent to one side; observe if the tip rubs against one tooth or the other of the guide; if it's clear on one side but rubs on the opposite side, remove the lever and bend it slightly to center it in the guide. Replacing goosenecks can be tedious, and requires patience and fortitude. See that every one falls back into place by its own weight. Also see that each gooseneck tip lines up pretty well with its neighbors; then turn the cam rolls by hand and see that they rise to the same height — half a dozen at a time.

This sort of job need not be done too often — perhaps five to ten years. In the meantime, I have had good luck by squirting gasoline and graphite along the pivot rod. Be sure the gasoline is white and high-test — no benzene or alcohol or other solvent.

Removing and Cleaning the Verge Rack

See *To Remove Verge Rack from Model 5.* page 8. See *Replacing Verges,* etc., page 7, for cleaning directions. It is highly important, if you clean the entire rack, to keep the verges in order. I usually lay them out by sections (18 in a row) to provide a check. On a Model 5 it is easy to turn all the verges backward in replacing, and not discover it until you try to put on the springs, so watch.

Why so Much Trouble After Cleaning the Keyboard?

LOOMIS: It is a universal experience to have all kinds of little troubles after thoroughly cleaning a keyboard and putting it back together. In many cases this is due to lack of experience, but there is a large class of trouble that is not covered by this reason.

Here, I think, is the answer: A certain part wears or gets dirty, and other parts compensate, or the operator himself, over the years, does things to compensate. Then when that dirt is removed or those worn parts replaced, a new factor has been introduced. It takes a little patience and a little care to iron these out; don't be in a hurry. Allow a half hour or an hour for this final "unbugging."

Naturally it will help to keep everything in order, including keyboard cams, but even then trouble will develop. My usual trouble is that cams fail to turn over; my favorite remedy is to switch cams a few times; this generally clears it up. But on old machines, you may have to check through the list of keyboard troubles. This itself is not very involved, for you have one big advantage on your side: you know the thing is clean.

CHAPTER III

REBUILDING THE KEYBOARD
ADJUSTING TOUCH OF THE KEYBOARD
MISCELLANEOUS KEYBOARD QUESTIONS

Rebuilding the Keyboard

QUESTION: Can you tell me how to go about rebuilding a keyboard? The boss is talking of buying a new machine, but the old one is adequate for us. The only difficulty is that we have lots of trouble on the keyboard. I maintain that even if it costs several hundred dollars for parts, it is far cheaper to rebuild the keyboard than to buy a new machine. — P. C., Crowley, La.

LOOMIS: How right you are. If it does take considerable money, it will be money well invested. Linecasting machines don't wear out, and if by a judicious selection of new parts and some careful work you can rebuild the keyboard in good shape, you can stave off buying another machine that much longer.

In rebuilding linecasting machines for Minneapolis' biggest used printing-machinery dealers for many years, I learned something about keyboard parts.

In the first place, of course in a small shop you cannot tear a keyboard down, order the parts, and sit around sorting mats until the parts come in. It may be months. So while you are thoroughly cleaning the keyboard, make careful note of all parts needed. As soon as the keyboard is back together, order the parts. When they come, put them away carefully. Six months or a year later you will get a chance to clean the keyboard again. Then you can do the actual job of rebuilding.

Examine the key levers. On the inner tip, on the end opposite the key-button, you will often find notches worn up to 1/16" square or more. I make careful note of these key levers. (The shortest ones are called the first bank, and so on, but I always note them by the letters they control.) In reassembling I put the worn levers on the far right, and try to keep all good levers in the first three rows and in any spots of constant use. You will then need to switch the keybuttons. You can remove them with a pair of keybutton pliers, or an ordinary pair of pliers if you need to. In using ordinary pliers, pad the key-button on top with a piece of chipboard, grasp the button firmly at one side, and rock it front to back. When you put it on the other key lever, use the pliers again, and also pad it again. This time you will have the bottom jaw of

the pliers under the key lever, and squeeze it on. Then see that the edge of the key lever is not burred. (You *can* push the buttons onto the key levers when they are in place in the keyboard without the pliers – just your fingers – but you'll be sorry. The key levers will bend and cause doubles later on.) If any keybuttons split, make a note of them also.

If the fulcrum rods are well grooved, you can shift them around to present new surfaces to the key levers. If they have been moved too many times already, make a note to order new ones.

Now examine the keybars or weights. Sometimes you will find them badly worn in the notches where the key levers fit. You can switch these around too, to present new surfaces to the key levers, unless they are the old style with only one notch in each. But note how you come out. If you have to use some in the worn notches, make a note of the letters affected.

Note if you need new guides for the weights.

If the banking bar is badly beaten up, a new one doesn't cost too much.

Now let's look at the cams and cam frames.

If the tips of the stop strips look worn, I would get new ones, especially if the old one are the thin kind (in that case, they've earned their cost already).

Always get new trigger wires and cam yoke wires. At two for a quarter (pre-inflation price) it's the cheapest keyboard insurance there is.

Occasionally you will find a trigger worn on one end or the other. Put it in some little used channel and make a note.

If you want to do a good job, examine the cams. Where the teeth are worn down pretty smooth, order new cams and yokes, assembled. Where only the stop pins are worn, order those. (See page 17 for suggestions on repairing these.) Where the pivot hole in the cam is worn so there is excessive movement, order cam and yoke assembled. Be especially critical of the spaceband cam. On machines that have the spaceband cam a little larger, it is well to have an extra new one always. Also examine the stop strip at this point.

Examine the spaceband keyrod. If it is beaten down at the point where it comes to rest, order a new one. If the upper hole is worn out of shape, it is a good idea to replace it.

Examine the keyrod lower guide. If some of the slots are badly worn, I'd replace the guide.

On machines of the Model 5 type, you will often find the keyrods chewed up where they come down on the verges. These need replacing. See page 41 and 48.

On Models 8 and 14 it is seldom the keyrods but more often the goosenecks. Test them as advised on page 43, and in addition note replacements for any that are bent or twisted. It is good to have half a dozen on hand, for once in a while a gooseneck gets caught when you are changing magazines.

The verge rack, if very old, may have to be rebuilt also to bring the machine up to first-class assembly condition. Proceed as suggested on pages 7-8. Replace verges that have worn holes or gouges made by keyrod or plunger. Replace gouged pawls made by mats' striking them. This is not usually too expensive; it is work — tedious, painstaking work — that is required here.

Now send in your order for the parts you will need. Ordinarily it won't require much of anything but key levers and keyrods. Some old keyboards have a very bad set of cams, but it will run into money to replace them all. If the shop won't stand it, do your best for the first three rows, and the quads, comma, period, figures, first two rows of caps, and the dash.

Adjusting the Touch on a Keyboard

QUESTION: I have heard there are ways to make the touch lighter on a keyboard. Can you tell me how to do this? — A. G., Mason City, Ia.

LOOMIS: Yes, the old-time piece operators can tell you how — and I will. On most machines there used to be a thin and narrow strip of metal below the keybars or weights; this was about the size of a keyrod and was dropped into the brackets before the weights were put in. I am not sure what its purpose was, but the first catalog I find it in, is for Models 16 and 17, and there it is called a keybar guard. The old-timers would get 18 or 24-point thin spaces (somewhere from two to six points thick) and put one under the guard at each bracket. This would have the effect of raising the weights a little, thus requiring less movement of the keybutton.

On a machine with the parts in good shape, this would help, but on a machine that's maybe forty years old, I doubt it. However, it's easy to try, and nothing will be hurt whether it works or not. You may get a lot of doubles.

I have come to the conclusion that a heavy touch is to quite an extent due to worn parts working against each other, as at the end of the key lever where it fits into the keybar. The loss of metal at these points requires a longer and often a harder stroke because you have actually to jar the cam yoke into action. Also, the rust that usually is present at these points makes the parts work harder against each other.

Therefore a lightening of the "touch" of the keyboard is most effective after you have rebuilt the keyboard as outlined in Chapter II. Let us suppose you have done that. Now I can tell you how to achieve a perfect touch. For this knowledge I am indebted to Frank Phillips of the Teletypesetter Corporation. (At the time he showed me this, he was installing two teletypesetters in a shop where I worked, but he is now manager of the Chicago branch.)

It is easier to do this with the keyboard off the machine, but not essential.

Take off the back cam frame; have the front cam frame in place. Prop up the keyboard and take off the banking bar. Knock the dowel pins all the way

out of the banking bar. Put the bar back in place and see tbat the keyboard is fairly level.

Get six 2-point leads twenty-five or thirty picas long. Face the keyboard from the back. Now lift the weights at the left end and put one lead on top of the banking bar and up against the weights in their notches. Let the weights down on the lead. Do the same at the right end. You have now raised the weights two points at each end.

Turn the front rubber roll shaft away from you (anti-clockwise). None of the cam yokes should drop. Increase the two points to four. Try the roll. Approximately half the yokes should turn over (counting only those supported by the leads, of course). Increase the four points to six. Try the roll. Now all of the yokes should drop and all cams turn over.

But let's say, with two points under, that some of the cams turn. Then the banking bar is too high. Tap it down a little and try again. Sometimes you have to file out the screw-holes in the ends to get a full adjustment.

If, with six points, not all cams turn, then, if it is not the fault of the individual cams, the banking bar is too low. Tap it up.

Note that you do not touch the keybuttons. You merely turn the rubber roll. The crucial stage is the 4-point lift. Count the raised weights and count the cams that are tripped. The cams should be very near half the weights – on each end.

When you get it exactly right, be sure the banking bar is tight. Then drill new holes for the pins and dowel it back in place (this is where you need to have the keyboard off of the machine).

For a double check, try the leads again. You will find this can be a very touchy setting, but, once set, it will stay. Be sure both ends are alike. Try the cams a number of times. When you are satisfied, put on the back cam frame and see if you get the same result. I have not encountered one where the cam frames differed substantially, but I suppose if one should, he would have to move the cam frame up or down a little in the same manner.

To Replace a Single Keyrad

QUESTION in *The Graphic Arts Monthly:* Will you be kind enough to detail operations necessary to remove a keyrod on a Model 5 and put in a new one without taking all the keyrods off? – L. E., Kalispell, Mont.

This situation does not occur too often, but it causes worry when it does happen. Therefore it is worth putting down here:

1. Lock and remove the magazine.

2. Elevate the keyrods to clear the verges with lever at the right above the keyboard.

3. Release and push back the verge rack to separate completely the rods and the verges.

4. Remove verge rack (one screw in each end).

5. Remove the detaining bar that keeps the keyrods in their upper guide-plate slots.

6. Remove the spring at lower end of the keyrod.

7. By slightly warping and manipulating, plus a slight loosening of the two screws that hold the lower keyrod guide-plate (but be careful — this is touchy!) you will be able to raise the keyrod out of the lower plate. It can be twisted a little to clear the keyrod elevator bar.

8. Be sure the new keyrod is the correct length. You may have a Model 1 keyrod.

9. Remove the spring hook and attach it in the same position on the new keyrod. Reverse your warping and manipulation and insert the keyrod first above, then below. Replace the spring. Tighten the screws. Replace the upper detaining bar. Replace verge rack. Move keyrod assembly back over the verges. Lower the keyrods. Replace and unlock magazine.

This general type of procedure applies to all machines without the keyrods in a frame which lifts out as a unit.

Thin Mats in Split Magazines

QUESTION in *The Graphic Arts Monthly:* What causes thin mats to hang up in the ½-split channel? They seem to hang and overlap, but I have not yet worked out the remedy. I will appreciate your suggestions.

HARDING: The split magazine was made for display mats and will give trouble when thin mats are used without alteration of the magazine channels at the top of the lower magazine. This must be done by a repair house. You may have to trade your split magazine for a standard magazine.

Auxiliary Magazines

QUESTION in *The Graphic Arts Monthly:* We have trouble with the distributor and escapement when using the auxiliary magazine on our Model 14 Linotype. Do you have any suggestions that will help? — F. H., Madison, Minn.

HARDING: Your letter presents a common problem. Some mechanical devices give trouble because of continued use without proper care while others develop trouble because they are not used enough to keep them in working condition. Your auxiliary falls in the latter category.

Because auxiliary equipment generally handles large and heavy mats, and because it is not used much, comparatively speaking, and so does not suffer from wear as does the main keyboard, it will operate for a long time rather dependably, even though the magazines seem to gather more dirt, and the entire mechanism gets much less care. But trouble shows up when a font of ordinary sized mats is run into it, for the smaller mats do not have enough weight to overcome the resistance offered by dirt.

Certain routine care is advisable. Get a channel entrance cleaning brush and use carbon tetrachloride to polish the channel entrances. The manufacturers have such a brush, or you can get a small round brush from a creamery.

Brush out both top and bottom magazines as advised in Cleaning the Magazine, page 31.

Here you can squirt a little high-test gasoline and graphite into the verge rack also. On the old style "punchboards," you will note many of the keyrods have double springs. Be sure they pull the keyrods back down. Check verge springs. Try the keyrods with pliers. From the plungers on up, all the suggestions under Keyboard Troubles in Chapter I apply.

If a single-keyboard machine, all suggestions applying to the keyboard proper are applicable.

Note the lugs on the backs of the auxiliary keyrods under which the bail box levers rest. See that the bail box levers are not slipping from beneath these lugs. Check also the lugs on the main keyrods that operate the bail box levers.

Examine matrices for damage.

LOOMIS: I have had some interesting experiences with these auxiliaries. In the course of maintenance and later in rebuilding, I tried many things to improve assembly from them. I took one apart and emeried the parts and graphited them, and saw that every part worked perfectly, but the result was no improvement. I took this same one apart a number of times without any better outcome.

My final experiment was to remove the box containing the auxiliary levers (a small box, on the punchboards — a long box called the coffin or bail box, on single-keyboard machines) and dunk it thoroughly in kerosene. Let it drain for a day or two, wipe off the surplus with care, so it won't be dripping on your clothes and your copy, and put it back. This worked better than anything else. But on the punchboards I have improved things by squirting the keyboard mechanism liberally with gasoline and graphite (always high-test white gasoline) and wipe off the surplus. Even though this is essentially messy, you don't have to do it messily.

To Remove the Bail Box

There are two rounded-head bolts and a dowel pin at each end. Also at the right end are six semi-circular holes through which you can thrust cam frame wires to lock the levers. Take off the distributor driving belt and the grease cup. Then loosen the screws, pull the box from the pins, and slide it out. That wasn't hard, was it?

Much Trauble May Came fram Lack of Alignment

The day before I wrote this, it was called to my attention in the shop where I care for the machines, that a certain letter in an old style auxiliary never had dropped dependably, and was that day worse than usual. The mat just stopped. The operator could pull it down with a touch of the hook, but it wouldn't come down alone.

I took a couple of hours, got a light, and went into it. Wound up with the escapement cover off. The mat acted as if the magazine had been cleaned with something that had left a residue. But I had just polished it with carbon tet. Got a pair of tweezers and pushed the mat slowly up and down at the exact spot where it stopped.

Finally discovered the channel in the verge rack was not exactly parallel with the channel in the magazine. When the mat made the slight turn, the ears would bind. We thinned down the toes of a mat, and it went through fine. We filed them all down rather than butcher the verge block. Since then I have recalled others that have acted that way, over the years, and I wonder if a lack of perfect alignment may be the answer to a lot of them.

Warped ar Sprung Magazines; Taking a Magazine Apart

QUESTION: One of the magazines for our Model 5 fell off the wall during the night, and now we are having trouble with it. Mats in the figure section don't seem to drop — and we have tried everything. — C. B., Gettysburg, S. D.

LOOMIS: If this trouble originated abruptly after the fall, and if you have checked everything else, it is entirely possible your magazine is sprung or warped. A magazine falling on a corner will take a permanent wave that interferes with assembly.

First, take two long pieces of strip material; lay them flat on a stone and push their bottoms together. If they are straight, there won't be any crack between them. Turn one over, end for end, and try them again. If there is still no crack, you probably have a couple of straight pieces.

Use one of them to try the magazine. If a magazine is really sprung, it is generally quite obvious when you put a straight-edge on it. If it is noticeably bowed, there's not much you can do. You may try loosening the magazine screws a little, but if this doesn't work, you're probably stuck for a new magazine. As far as I know, they cannot be repaired. I have had them apart and tried to

take out the kink in the top or bottom plate, but without success. When you get it out one place, it appears in another.

This also can happen in a fire, when a magazine gets hot and water is thrown on it. And sometimes a magazine that goes through a fire will look all right but will have "lost its temper" – will be soft.

Minor bends in a magazine plate can be remedied. Let's say you are hanging up a magazine and you bounce it against a nail and bend in the first section at the top of the magazine. Get a Hempel quoin and file the sides smooth. It will just fit in a magazine. Now get a long piece of ¼" rod and square one end to fit the quoin. You can maneuver the quoin and expand it and do a pretty good job of minor straightening. You will have to expand almost to the limit of the quoin to do any good, and you may pop off a few screw-heads, but there are times when this is a life-saver.

If somebody else takes a magazine apart, you may want to know how to put it back together. Start at the bottom. Put in the screws in the bottom row. Now, at the top, spread the plates far enough to slide the short dividers into the grooves. Push them down with the handle of the magazine brush. More screws. More dividers. The dividers with the holes should have the holes lined up with the holes in the magazine. When you get all through, tighten all around two or three times – but be careful with the screws in the middle; they're fragile.

To Take a Burr Fram a Magazine Channel

HARDING: If somebody gets this careless, first sentence him to three days' sorting leads and slugs, then get a thin warding file that will go into the channel, grind it .762" wide to fit the channel from top to bottom, have a ¼" rod welded to one end, and proceed cautiously to smooth out the burr. William Reid & Co. has a set of broaches (three sizes) for this job, but Chicago may be a long way from you, while press-day is just around the corner.

Taking All Magazines Off af an Old Style 8

QUESTION: Is it possible to take all the magazines off our Model 8? The bottom magazine has not been cleaned since the machine was installed.– M. S. T., Wheatland, Wyo.

LOOMIS: In tests from coast to coast, this question ranked No. 1 among those who know their back squirts best! It is indeed asked more than any other. Most m-o's have discovered it is wise to run the 14-point in the bottom magazine, because it is not affected so much by dirt. But the answer to cleaning is: yes – and it isn't too hard when you know what to do.

On the old style 8's – those with fixed side-pieces to hold the verge rack – you must take off all magazines to get the bottom one off. It *has* been done otherwise by experienced and dextrous machinists, but that is nothing for an m-o to try. He hasn't enough arms.

First, lock all magazines. There are openings in the right-hand side-piece for the middle and bottom one.

Next, go around to the back, up on the step. Pull the channel entrance down. At right and at left of the magazines you will see two gibs. They are flat pieces of metal about ½" wide and about 4" long, and each has four screws holding it down. The left one has a shallow notch in one edge. With somebody to maneuver the magazines up and down so you can reach these eight screws, take off the gibs.

Now run the top magazine into position. Take off the flat bar across the top, if there is one, then pull the arms down and lift off the magazine.

Move the arms to the second frame. Take off the top frame — it lifts out. Take off the top verge rack. Mark both of these with a "T", and also the magazine.

Run the middle magazine into position. Pull down the arms. Take it off. Mark it "M". Lift off the frame. Take out the verge rack. Mark them all with "M".

Now you can lift out the bottom magazine — it's easier with help — and then you can hold the verge rack while somebody loosens the two big slotted-head bolts that hold the right-hand side-piece, enough so you can lift out the verge rack.

When everything is clean, reverse operations. Get the bottom verge rack in first and tighten the side-piece. Then the bottom magazine, and be sure the copper magazine clamps at the top go into their proper places under the magazine.

The top frame, if you get them mixed up, is the one with the most knobs along the sides. The gibs go on last, and there is a right and wrong to them. If you don't make sure the holes are lined up first, you may get three screws in and have quite a tussle with the last — and lose. Watch the notch in the left one; it coincides with a notch in the guide to which it is screwed.

NOTE: It is possible to take out the middle verge rack without removing the top frame or even the top magazine. Lock the top magazine and raise it with the arms. Take out the top verge rack. Lower the magazine. Lock the middle magazine and run it into position. There are a couple of long fingers that stick up from the frame of the machine, one on each side about two thirds of the way to the top of the magazine. Pull these forward under the appropriate knobs on the middle frame. Lower the magazine slowly, allowing the fingers to push up the magazine frame. Presently you can reach in and take out the middle verge rack.

You need to be careful with this, but you'll find it sometimes saves a lot of time when a verge spring breaks on the middle rack.

DAMAGED MATS

LOOMIS: There are many questions asked about damage to mats. Let us give here a concensus:

Lower front toe has burr on left side: This is caused by the toe's hitting the glass as it comes out of the magazine. Install a pressboard or tin buffer. This may also be caused by hitting on the small assembler entrance cover.

A mark just above the lower front toe, on the left corner only: This is a frequent occurrence. Obviously happens in line delivery, either from the delivery channel aligning piece, a sharp corner or burr on the delivery channel (if solid, as on Intertype), or a first elevator duplex rail that projects out too far.

Toes damaged when casting short measure: This is caused by the last mat creeping up, because on short measure the line is often snug; it indicates a worn back jaw.

Upper side of lower front toe is sheared: This suggests a bent duplex rail and perhaps a sluggish vise automatic.

A deep dent on the casting side, just above and below the light-face die: This indicates a squabbled line. The mat was locked up out of square, and you're lucky you didn't have a squirt; it must have straightened out before the cast. This might be caused by damaged or improperly set elevator jaws, burrs in the jaws, interference from the duplex rail. Recurring squabbled lines call for careful examination.

Back toe (casting side) clipped off on top: The first elevator does not drop far enough in seating. End mat on a tight line was forced up.

The top of the lower back toe shaved off minutely: Probably indicates a sloppy back jaw, providing all the mats are not that way. If all are, the first elevator is seating a tiny bit too high.

Bottom corner of a back toe sheared: The first elevator seats too low.

A dent across the middle of the back toe: A double-black lockup.

This may also be caused by hitting on the small assembler entrance cover.

Tops of ears bent forward or scraped: Usually indicates faulty lifting of the mat onto the distributor bar. The mat lift may be set too low or may not be working right.

Burrs on the left-hand side of the teeth: These should be removed with care. A mat drops from its topmost tooth, so this one should be in good shape. On Models G and H Intertypes, however, the mat falls from all teeth at once.

A bright mark on the index side above the letter, all the way across: Probably the mat guard, between the two front screws, is set in too far.

Brass dust around the mat lift: This generally means the distributor box is set too high, so the top of the back ear of each mat is forced against the brass strip in the distributor bar while the mat is still riding the level space at the end of the distributor box rails.

A rather deep and sharp dent in the right side wall: Generally does not happen often; another mat hit it in the assembling elevator.

The back lower toe gets the most wear: The mat measures .750" across the toes in the beginning. Any mat that wears down to .730" should be discarded. Otherwise it will jump up on the lands between partitions of the magazine, or ride the magazine lands on its body and therefore fail to respond promptly to the escapement.

Do not use a mat file promiscuously: It is only for removal of actual burrs. Thinned toes cause trouble in the escapement.

Thin mats especially, or small sizes, may double up in the channels if their toes are thinned.

Remember: A sloppy back jaw or sloppy fit can produce a lot of different marks, for it allows mats to jump up out of their proper position.

Installing a New Font of Mats

From a leaflet by the MERGENTHALER LINOTYPE COMPANY: A full font of mats now is worth around $500, so you can afford to use great care in installing them.

Magazine should be thoroughly cleaned.

Spacebands which are rounded, damaged, kinked, or have metal adhesion, should be discarded. (LOOMIS: I recommend a new set of bands for most country shops.)

The forward thrust of the mold disk must be properly set.

The pot lockup must be correct.

The elevator seating adjustment must be held within .010".

See that the mold disk retracts between justifications, the first elevator rises, and the pot itself recedes.

Line delivery channels should be checked for smoothness and correct setting.

First elevator jaws and duplex rails must be in good shape, square, and snug.

Have the vise jaws reground.

Set the pump stop lever.

Replace first elevator link eyebolts and pins if worn.

Oil in any form on front and back mold wipers will cause metal to collect on the side of the matrix and result in hairlines. (LOOMIS: This is where I disagree. It will do this if it reaches the mats, but I have found to my own satisfaction that it can be so used that it will not reach the mats, at least on the back wiper and perhaps on the front wiper, with resultant good to the molds – which also are expensive.)

Do not use oil on plungers or in remelting. (LOOMIS: I agree.)

CHAPTER IV

ASSEMBLER ENTRANCE GUIDES
MATRIX DELIVERY BELT AND CHANNEL
ASSEMBLER, ASSEMBLER SLIDE
MODEL 15 ASSEMBLY

Lining Up Assembler Entrance Partitions

QUESTION: Two of the fastening lugs have broken from our assembler partitions. How do you take proper care of this plate? — C. L., Garden City, Kan.

HARDING: It is important to keep the partitions clean, to keep them from standing in the path of matrices, as the mats leave the magazine, and to keep them curved at the bottom so that they will permit a free, smooth "flow" of the matrices to the assembler chute. The partitions must not retard any matrices. They must be curved at their lower ends to prevent the matrices from striking the matrix belt and rebounding. Interference by the top or bottom of the partition will cause transpositions of matrices. Dirt on the guides, the back plate or the assembler cover will be transferred to the matrices, and finally to the magazine. Avoid excess oiling throughout the machine.

The Flexible Font

The Models 1 and 3 Linotypes are constructed in a way that allows the upper part of the front to swing forward for the purpose of changing magazines. In these instances, the partitions are in two parts.

The flexible front is adjustable with relation to the magazine by a headless screw at the right lower end of the magazine. When making the adjustment, set the second partition at the left so that it will rest between the lower-case *i* and *n*. Then try all other characters that are adjacent to partitions, especially the first parenthesis. But if the top of only one partition stands in the way of a matrix, use long-nosed pliers to bend it slightly to one side. Be careful, because there is a small lug to hold the partition in place. Careless handling will break the lug.

The Linotype Stationary Front

All assembler fronts are now in a fixed position, except some of the mixer models. Those for the Linotype are still in two pieces, but the partitions are in one piece. If necessary, the top part of the entrance plate can be shifted slightly by removing the four holding screws and the dowel pins, but adjustment is very seldom necessary.

When typewriter or display mats are run in the old Intertypes, the mats will strike the tops of several partitions. To overcome the trouble, cut 5/16" off the tops of the partitions. However, don't cut all the way back; leave 3/32" at the back (it will be in the form of a vertical strip) to guide the milled matrix ears. Actually your 5/16" removal will be in the form of a notch.

To Remove an Assembler Entrance Guide

These guides are held in several ways on different machines. Some of the partitions have eyed lugs that pass through the plate; these are held from behind by wire rods that pass through the eyes. Other partitions have split lugs which are held by a split nut. Still other partitions are held by screws.

It is awkward to reach some of them, but usually it can be managed, with patience and dexterity.

The older style assembler entrance guide (or partition) plates, both Linotype and Intertype, are in two parts. The flexible front for the Models 1 and 3 Linotypes is hinged and may be removed by loosening either hinge. Be careful not to bend the "feathers" at the lower ends of the upper guides.

The upper plate on other Linotypes and older Intertypes is held by two screws on each end. The guides are in one piece. Before starting to remove the screws, move the magazine out of the way and remove the chute spring. Now remove the four screws already mentioned. Look closely and you will discover, almost directly under the pivot for the horizontal spaceband lever, one of the screws that holds the entrance plate to the faceplate. If this is a blind screw, it may not be easily detected. If the spaceband horizontal lever bracket stands in the way, disconnect the spaceband keyrod, remove the two screws that hold the bracket and lift off the bracket. Now look from the rear for a split nut that holds the blind screw. Remove the matrix belt idle pulley.

Remove the other two screws that hold the plate. One is near the bottom of the spaceband box, the other is under the matrix belt support, near the lower end or up near the idle pulley. After the three screws have been removed from the new style Intertype, or the seven screws from the Linotype, the plate is free and may be removed.

Intertype Front Guides

The old style Intertype front guides may be adjusted according to directions for the Linotype stationary front.

The new style Intertype assembler entrance plate is adjusted forward or back, by loosening the three holding screws and turning the adjusting screws, one of which is at the right of the upper end of the chute spring plate and the other behind the mat belt idle pulley.

Motrix Buffer at Top of Assembler Entronce Cover

Wear on the lower front lugs of matrices has been greatly reduced by the application of a pressboard buffer plate (or celluloid or tin) at the top of the upper assembler entrance cover. Do not allow this to become too badly worn before replacing. It is a real saving for matrices.

To Adjust the Assembler Entronce Plote

LOOMIS: There are occasions when it is good to know how the assembler entrance plate should be adjusted in relation to the magazine.

1. There should be from 1/32" to 1/16" (not more) clearance between the plate and the magazine. On many older machines this is adjusted by screws that move the magazine frame forward or back. On others there are adjusting screws on the front plate itself. On others, you will have to shim. Watch both ends.

2. The floor of the plate should be about 1/32" below tbe floor of the channels in the magazine. Some magazine frames can be adjusted to provide tbis, but on many machines it is necessary to move the plate. Loosen the screws and pry very gently up or down, then tighten while holding. Sometimes — but not often — you will have to take out the dowel pins. Watch both ends. On old Model 8's, if they have been treated roughly in changing of magazines, you will find the various segments at the upper edge of the thick plate out of alignment. Make them all the same with a large pin punch and a small hammer.

Obviously, if the plate is too higb, mats will hit it. Not so obviously, if the plate is too low, the mats will have to drop their bottom ends so far as they leave the magazine that the mat will stop about half-way out and hang there.

3. The sidewise adjustment is best made, as Harding says, primarily on the partition between *i* and *n*. Use your biggest mats. Note that on big mats the partition will have to go as close as possible to the *i* to allow the big overhang on the *n* to clear.

4. On big mats, careful bending with a pair of long-nose pliers may be necessary after the plate is set. Also, Harding points out that on many machines,

with a wide 14-point or with typewriter mats or with aligning gothic, it may be necessary to clip the tops off of some of the partitions to the depth of 5/16". But he adds, be sure to leave at least 3/16" support of the lug. Sometimes it helps to file the partitions on the sides; it doesn't take much thinning to do the trick, as a rule. In testing, try the biggest mats that will be used.

I may add that I personally do not like long partitions that vibrate back and forth like a cavalry pennant when the troop is at the gallop. These partitions should remain steady; otherwise they are not going to be in the right place at the right time, and sometimes they will throw a mat clear out to centerfield. So I take them out and peen a bump on them near the lower end, where it will be bound a little by the upper or large assembler entrance cover (not the small one). With a little patience you can make these pretty solid, and your machine will assemble much better.

Should the First Assembler Guide Partition Be Loose?

Loomis: I have already said I do not like loose guides. It seems elemental to me that they should be fixed. When a guide is loose, a mat hits it and it flops. It may hit the next mat and knock it for a loop, and you have a transposition or a jam-up. It is fairly easy to fix this guide if it is loose. Make a tiny right-angle bracket from an old key rod, with the ends about ½" long. Take out the guide and fasten the bracket to it, by a screw which will be filed off smooth on the inside, or a couple of brass nails which will be riveted down, or a good job of soldering. This should be done so the other leg of the bracket will lie flat against the assembler entrance plate, and about 2" to 3" from the bottom end of the guide.

Replace the guide. Spot the bottom end about two picas from the chute rail springs, drill a 5/32" or No. 28 hole, thread it for 8x32 screw, and fasten it down. You can bend the bottom end plenty to secure adjustment.

You can buy D-2738, Assembler Entrance Plate Guide, Assembled, which comes with the little bracket, but you have to drill and tap the hole yourself. I prefer this solid one to those with the flat springs on the end.

Matrix Delivery Belt

Harding: The mat belt needs replacement when it becomes stretched so far that you cannot keep it snug, or when its edges get worn too thin. When new, most belts fit with the proper tension when the idler pulley is dropped into its lowest position. As it loosens, adjust the pulley. If you stretch the belt too much, it will reach the stage of uselessness sooner. In an emergency you can wrap the idler pulley with a few turns of friction tape, and dust it with talcum powder to prevent stickiness – but order a new belt at once. Do not use home-

made belts. The mat belt looks simple and innocent, but once you install a home-made belt you will have to make all kinds of adjustments to get it to work, and then the regular belt will never fit.

LOOMIS: There is one aspect of installing a new mat belt that is tricky. Often you will put on the belt and watch it turn over a few times, and it looks all right. But a while later you notice dust is gathering on the copy-board, and it looks like leather scrapings. It is. The new belt is being scraped by the upper ends of the Linotype assembler chute rail springs — the long, thin springs. Take the rails off. If the springs are soldered tight, as they should be, either file in the under corners of the springs or grind them against a stone with a square edge. Take off about two points at the top of the spring where it meets the belt. Now bevel it underneath to give a little more clearance. Put it on and try it again. If there's no dust after fifteen minutes, you've got it. You may have to do it again, but *use caution.* If you take off too much, thin mats will catch in the crack. You can remedy that somewhat by bending the flat ends in a little toward the belt. In applying new springs, it is good to apply a new belt at the same time, and it is not unusual to find adjustment necessary when you do. If you put on a new belt without this fitting, the belt will soon be worn thin at the edges and you won't have much belt left. You might as well leave on the old one.

Idler Pulley

QUESTION: The mat belt constantly runs against the assembler entrance cover, which slows it down. I can also occasionally hear mats clicking on the matrix belt supporting plate, which is bare on the far side. Is this something that can be fixed? — R. J. H., Worland, Wyo.

LOOMIS: Indeed it is — and should be. You'll get better assembly if you examine the idler pulley. Generally you will find this canted down toward the star wheel as a result of long wear and lack of oil. Probably you will have to buy both idler pulley and its stud. They are easy to install.

Sometimes on older machines you will find the lower pulley canted upward with the same result. This too can be fixed. If your assembler block has a bronze bushing, then you will need the bushing and the pulley shaft. If there is no bushing — miomi! If you have a good handyman with machine tools, he can bore out the hole in the block and put in a bushing, but it isn't easy. Sometimes it isn't easy to get an old bushing out, either. You may have to improvise a small device like a wheel-puller.

It is worth noting that I have never found a machine that could not be repaired, and in over thirty years I have seen only one that I thought was not worth repairing. The linecasting machine is made up of many small machines (credit to Harding for this statement), and ordinarily it is not necessary to buy

too many parts to repair it. Knowing what parts to buy, and especially the fitting of new parts to old, are the most important. Of course it is obvious that machines long neglected wear out all over in the course of a couple of generations, to the extent that the cost of rebuilding is more than the cash value of the machine after rebuilding. There is also the factor of obsolescence. Sometimes, after spending a great deal of money to rebuild a single-magazine machine, it is found that a more serious trouble is inability of this machine to handle the shop's work. Nevertheless, I have long marveled at the astonishing adaptability to repair of a linecasting machine.

Matrix Belt Support Plate

HARDING: This seldom gets or requires adjustment. The belt should just clear it (and not drag), so it will act as a bumper for falling mats. Take a look once in a while to see that it is not coated with gum which will drag on the belt and slow it down.

Assembler Entrance Cover

LOOMIS: This cover (the large flat brass plate that swings up) sometimes is the source of trouble in assembly. If the crack between it and the mat delivery belt support plate is much over six points wide, you may have mats catch in it, sometimes only temporarily. Get two long blocks of wood, 1x1" square, and with one on each side of the plate, lock the plate up in a big vise so the cover is at right angles to the vise and is held securely. The glass will be safer if you remove it first. (When you return the glass, use rubber insulating tape under the lugs to prevent cracking or chipping.) Lean on the cover and bend the bottom part down a little — not too much. You may have to try it several times. The idea is to bend it at the part just under the glass, and to avoid as far as possible putting a bow in the middle. Put it back and try it for fit.

The bottom part should fit up against the partitions. Now take off the catch. Usually the holding surface of the catch (the surface that lies flat on the cover) is worn rounded so the catch slides off the cover under pressure. Don't try to take this apart; it's brass, and the pin is usually corroded in. Put the catch in the vise, holding it at the smallest part, on the corner of the vise, and file the holding surface so it is flat and with a slight bevel toward the inside, so the catch will hold first on its outer edge. Where you find a catch that seems to have too long a shank, and won't hold the cover snugly, you can bend the shank a little in the middle and shorten it. You can also break it if you bend very much.

There is also the matter of the small cover over the assembler block. This should fit snugly but not in at the top farther than the big cover, or mats will hit on it. Sometimes it is necessary to put a slight bend in the big cover,

about three inches from the bottom, to pull it in. The small cover also has a round bevel to avoid mats' hanging up here. Very frequently assembler trouble is caused at this point. Now suppose the small cover won't stay up — leaves too wide a crack where it meets the large cover. You can take a drill (any size from 5/32" to about ¼") and change the location of the hole where the bump on the flat spring fits in to hold the cover in place. You can use a pin punch for a starting point (usually about 1/16" off center of the old hole), or you can start the drill in the old hole and turn it sidewise to move the hole.

Don't drill the hole more than enough to catch the bump. You may have to move it forward or backward. This you can do by holding the drill sidewise again. Also you can file off the top edge of the small cover to make it properly meet. If you do, note that the new edge will not be parallel with the old. The cover is pivoted; therefore start at the left edge (cover held in vise with a slug on each side to protect it), and increase the cut toward the right. Try it in place frequently.

Now there's one more trick in connection with the small cover. (Deceptive gadget, isn't it?) That is its fit against the assembling elevator gate. Having moved the hole to the right to get a better fit above, you may now find the cover binds — sometimes much, sometimes little, against the gate. Repair this by filing on the left edge, noting again that the smaller cut will be at the bottom.

We've used a lot of filing here. Note this: a file is a very useful tool; it is also a very dangerous tool. Use it with great discretion. Go slowly, with repeated fittings. This may save buying a new part, much delay, and doing the whole job over again.

This kind of work is not usually necessary on newer machines.

Harding suggests using a two-point lead under the rail springs, which would extend all the way down, and up past the gap. If the right combination is found, work up a piece of two-point brass for more permanence. This is similar to the thin steel plate on an Intertype (which, however, is not usable here, for the Intertype assembler differs).

It is important first to check the delivery belt. If the belt is worn thin, put on a new belt first. This often fills the gap. I have usually had good luck by installing a new belt and new rails. As told above, the rails must be fitted. There is also the problem of soldering the rails in place. I have put on many rails without solder, by bending the rounded ends in a little tighter curve, but these do not always stay.

About soldering rails: Allen's Soldering Liquid is my favorite for jobs like this. First fit the springs in snugly. It may take a slight bit of bending at the curve, and I usually give the spring a slight down curve in the middle, to assure snugness against the rail. Get the spring in place. Take the rounded end first. Solder it on the under side, on the edge of the rail only, to avoid

conflict with the pulley. Rub the spot with emery cloth, use the soldering liquid, and put a piece of solder about as big as ⅛" of pencil lead. With a hot iron, you won't have any trouble. Now take the other end. This is tricky. Use about the same amount of solder, which must be put in the bottom inside corner of the spring. Too much will get you in trouble with the chute block. This place is hard to emery; do it with the spring out of the slot; push the spring sidewise to get it out. It seems to take more heat here for a good soldering job that will stay. If you let the solder spread too far over the rail, so it locks up against the chute block, scrape it back with a knife.

Chute Block

HARDING: This part should be changed when the toes of thin mats get caught between the chute block and the star wheel. This is not the same thing as a mat that gets caught between the chute block and the assembling elevator.

I have seen machines where the dowel pins were missing. You need these, and probably the long flat head screw also (the pins are D-327; the screw is D-17).

Worn Chute Rails

LOOMIS: These are flat plates on which the springs are mounted. The front one in particular is subject to wear at the point where it fits up against the assembling elevator. Hold the assembling elevator to the right and observe this space at the bottom. If it is wide enough for thin toes, it is too wide. Temporarily you can peen it out and square it off with a file to a close fit, but it is now thin and will wear soon, so order a new pair and put them on together. It is easier if you order them assembled (i.e., with springs) to save soldering. Order a matrix delivery belt also, and fit the ends of the springs as described below.

Assembler Chute Rail Springs

LOOMIS: These are the long flat springs that carry the mats from the belt to the assembling elevator on a Linotype. They need replacement when they have that Christian Dior look — when the top is so low it leaves a gap between them and the belt, into which the toes of thin mats may catch. See the third section above on fitting and soldering them.

The Chute Spring

QUESTION: Which is the best chute spring? — K. M. C., Schoharie, N. Y.

HARDING: There are many chute springs. Sometimes one will work where another will not. I do not favor the one made of two flat vertical rails; this probably was designed for display mats, but is often used on small sizes. A good

chute spring should in general offer a flat surface opposed to the chute rail springs, should have a spring to allow give, and should have tips that project to the left to catch the ears of the spacebands and straighten them up. On a Model 15 the best spring is the type with a movable tongue controlled by a separate flat spring, such as the type for which Wm. Reid is well known. But this is not the only solution to the traditional difficult assembly of this model. See what Loomis says under *Making a Model 15 Assemble,* page 70.

The chute spring should be adjusted to allow a cap W to slide through freely. Hold the mat under the spring, then release the mat easily; it should drop on through. Less clearance will cause jamming up or delay at this point. More clearance will allow the mats to jump out.

LOOMIS: With many chute springs there is the question of height, a slot being provided for movement up and down (sometimes just enlarged holes). The chute spring should be as low as possible without interfering with the mats as they go into the assembling elevator. Likewise the points should extend about 1/16" to 1/8" inside the assembling elevator, just clearing the two assembling elevator mat retaining pawls.

HARDING: My test for height is to stand a spoke of the star wheel straight to the left (at 9 o'clock) and stand a matrix on the spoke. The top of the mat should just clear the tips of the chute spring ears.

Assembler Drive Belt Shift

HARDING: The newer style shift has a tight pulley and a loose pulley. If the shifter gets hard to move, it probably needs oil on the shaft. Some machines have an oil hole; others do not. The Intertype assembler drive belt must be crossed, with the one that runs to the lower pulley on the outside; otherwise, the belt will run itself onto the idle pulley. It should be noted, too, that sometimes the belt is shifted to the idle pulley but the assembler does not stop. The idle pulley must have oil. In most machines there is a hole at the back, but it is difficult to reach without taking off the assembler block.

Old Style Intermediate Drive Shaft Clutch

Many of these (with the forks that engage) are still in use, and many of them constantly slip out of engagement. There are three reasons: 1, too much oil; 2, weak spring; 3, parts worn rounded. If it is the spring, take off the knob (held on by a pin); the spring is in a slot in the shaft and under the knob; stretch it. If the engaging surfaces are worn, you can file them square (though it isn't easy) or get new parts.

Assembler Block

HARDING: This is technically the Assembler Plate (it does not appear listed complete with gears, etc.), but in most shops it is known as the assembler block. To remove it, take off the chute spring; take out the two large rounded fillister head screws. Pull forward to get the plate off of the dowel pins; then try to work it out. On some machines it comes out easily; on others you may have to take off the assembler slide brake lever. If this doesn't give clearance, remove the two round head screws under the assembling elevator that hold the assembler slide roll bracket, and remove this part. The assembler slide will sag and usually permit the block to come off. In some cases even this is not enough, and you have to remove the assembler slide bracket. See that you are not held up by the assembler drive belt.

Check the set screws that hold the gears. Oil the idle pulley; sometimes you have to remove it for this. See that the belt shifter is working; if the shifter is too loose, drive out the pin that holds the shifter fork and remove the rod. Usually there is a spring and a ball that works on two grooves in the rod. These should hold the rod in either position without requiring too much effort to shift it. See that the rod is oiled.

Matrix Catch Spring

HARDING: Linotypes have a small flat spring that protrudes through the plate about 1/16". This retards the top back ears of the mats and helps assembly. Its tension should be pretty soft. It cannot be adjusted on the machine, so do it now before replacing the assembler block. It must not bank against the left side of the slot before going below the surface.

Worn Assembler Gears

LOOMIS: Well worn gears on the back of the assembler block sometimes howl annoyingly. This usually is repaired by replacing the gears.

Star Wheel

LOOMIS: The older star wheels have a nut on the back with two flat sides. To remove the nut and get at the spring for replacement or readjustment, push in the clutch and send the line delivery over. Disengage the assembler drive so the belt is still. Feel behind with a Crescent wrench opened to ½", or, better, an end wrench. Get it on the nut; push down on the star wheel to break it loose; re-engage the drive belt, still holding the wrench in place, and the nut is off in a second. Keep your fingers in place to avoid losing the friction disk and spring. Disengage the drive.

Put cup grease in the gear before you put it back.

Tension of the Stor Wheel

HARDING: If the tension is too great, mats will be thrown out of the assembling elevator; if it is too little, large mats and especially long lines will be slow in falling into position. On an all-around machine, the star wheel should assemble a 30-pica line of your biggest quads without hesitation.

Loomis's quick test is to stop the star wheel by bringing the forefinger gradually — not abruptly — against it. It should stop without appreciable pain. Loomis admits, however, that the pain-threshold varies in different persons, and is unreliable except as a first rough test.

To change the tension, I use washers. To weaken the spring and reduce tension, make a washer with outer diameter the size of the stud nut. Put it over the shaft and tighten the nut up against it. To increase tension, make washers with *inside* diameter that of the stud-nut, and slip under the head of the stud-nut. This will compress the spring. Use 1-point or 2-point leads, or, better, brass rule.

LOOMIS: I have used the washers and I like them. However, there is always the danger that a new operator will take off the stud-nut and lose the washers without knowing it, so I favor doing it all with the spring. It isn't as definite but it's more nearly final. If the spring is weak, use a screwdriver blade to stretch it a little. If it is too strong, hold it flat against a grind wheel and take off about two points and try it again. I like to get the spring a little weak — where it won't handle the 30-pica line — and then gradually strengthen it. An old spring sometimes loses its compushency and won't stay when you get it set, but gradually weakens.

I also make a practice of using oil inside the gear where the friction disk runs. You will find that with oil you will need a stronger spring, but the parts will last indefinitely and hold the proper tension. If you run a machine with extreme sizes, such as 6-point and 24-point, you may find yourself wishing you could adjust the tension. You can. Putting fresh oil on the disk will soften the spring; a squirt of gasoline will stiffen it. But use a little discretion in squirting around a gas pot; don't squirt so the gasoline will spray all over.

HARRY G. POTTLE in *Who's Who in the Composing Room* tells of a gauge to test star wheel tension. He fits a piece of ¼" square tubing over the front end of the star wheel shaft (star wheel removed). To the outer end of the tubing he fastens, at right angles, a strip of steel. At exactly 5 inches from the center of the star wheel shaft he hooks an 8-ounce spring scale and turns on the belt. The star wheel shaft should slip on about 4 ounces at this distance. (I like this Pottle; he uses gauges.)

When to Replace a Star Wheel

LOOMIS: When the star wheel is too worn to push mats inside the assembling elevator pawls, put on a new one. There are many kinds, but the fancy ones – large sizes, three-pronged, etc. – are for machines designed for them, and usually machines with unusual conditions. I stick to the old style four-pronged stars when possible. Older stars customarily had to be broached out or filed; the new ones seem to go on more easily.

Making the Assembler Slide Work Right

QUESTION: No matter what I do, I cannot make my assembler slide work right. It chatters; it fails to return. I have put in new brake shoes without success. What do you suggest now? – M. L. R., East Liverpool, Pa.

HARDING: This is not always a simple answer, and yet it is not too involved. Let's go all the way through.

The slide should not be oiled. Rub in graphite with your fingers. The slide itself gets bent or wears out. Take it out and sight along it to see if it is bent. Examine it for nicks or wear-grooves. If you order a new one, lay the old one on the catalog page and check it hole for hole. There are quite a number of different kinds.

Why Does the Assembler Slide Chatter?

There are several reasons. First, drop the assembling elevator to its lowest position. Now set the screw on the brake lever releasing lever so there is about 1/32" play between it and the end of the operating lever (the long lever that extends to the left, under the assembling elevator). This is the usual correction.

Now have a look at this long lever. Take out the one screw that holds it in. Is the flat spring at the right end of this lever in operating condition? It should be strong enough to hold the lever either up or down. A film of grease on the boss against which the spring works will save wear and rust.

Drop the bracket under the assembling elevator that holds the assembler slide roll, by taking out the two screws. Oil the shaft of the roll and replace.

Sometimes the assembler slide finger hits the star wheel. There is an adjustable buffer at the right end to control the banking of the slide.

How about the brake shoes? Are the corners worn down? Most of these are reversible so you can use four corners.

See that the brake spring is there. If you think it is weak, try adding a rubber band before you cut off the spring.

See if the assembler slide bracket (the one that releases a too-full line) is tight on the machine. It may be necessary to set these screws with glue or shellac or Smooth-on or stiff job ink. Be sparing; don't smear it all over.

On newer slides there is a roller that fits over the head of the lower screw in the slide bracket (you reach the screw through the round hole in the slide). Sometimes it helps chatter to put a drop of oil inside the roll.

Above all, be sure the assembling elevator is seating every time it returns, so that the operating lever goes down on the left end and up on the right to provide that 1/32" clearance.

Slide Moves to the Left With Difficulty

QUESTION: My assembler slide seems to hit a hard spot as it goes to the left, and causes jumbling of mats. Can you suggest what is causing this? — R. T. S., Ludington, Mich.

HARDING: Check these:

1. Be sure there is sufficient tension on the star wheel.

2. See that the slide is not bent or nicked.

3. Look for a loose screw on which the slide may rub.

4. See if the slide bracket is loose.

5. Graphite the slide with fingertips, rubbing well.

6. One of the most common causes and one of the hardest to spot: interference from the bell hammer trip. It may need oil or it may need a weaker spring. Try grease on the pawl. Interference here is why many operators take off the trip.

7. On rare occasions, the large roller under the left end of the slide will bind in the groove in the slide. The only immediate answer is to thin the edge of the roller on a grind wheel.

8. The screws that hold the assembler slide finger, if a little too long, will hit on the assembling elevator as the slide goes over.

Why Does the Slide Fail to Return?

LOOMIS: Most common fault here is too wide a gap between the brake release lever adjusting screw and the right end of the long operating lever mentioned above. About 1/32" is right, though some machines will take considerably more. Less will cause chatter.

Sometimes the left end of the operating lever, which is moved upward by the assembling elevator at the top of its stroke, is worn until it has very little movement. Some operators have put pins or screws in the end to correct this, but a new one is not very expensive.

Check the same items as for difficulty in moving to the left: graphite, bell hammer trip, loose bracket, loose screw, bent or nicked slide, loose brake shoe.

Should the Assembler Slide Return Spring Be Stiffened?

LOOMIS: I have been guilty of this myself. Very seldom does it need stiffening. Hold the brake lever in the clear and try the slide back and forth by hand. It should be free and easy, and if so the spring need be just strong enough to bring it back to the star wheel. If, when the slide is back to the star wheel, there is still a little tension on the return spring, it should be strong enough. Check the points mentioned above. Too strong a return spring will cause chatter and will also require a stiffer star wheel, which in turn may knock the assembler slide too far with the heavy mats, leaving a gap that causes jumbling. Tricky, isn't it?

Too soft a return spring will give almost the same result.

To test tension: if the slide is free and smooth when tried by hand, watch how it comes back when you send up the assembling elevator. It should return all the way without noticeably slowing down. If it slows down near the star wheel, and the slide is still free, the spring probably is at the limit of its contraction and needs stiffening.

To Remove Assembler Slides

Linotype: Disconnect the short link at the right end; don't bend the slide with the screwdriver. Remove the headless screw from the right side of the release lever in the slide bracket; don't lose the spring. Take out the two screws that hold the bracket (one is reached through the hole). Watch for the roller behind. Remove the brake trip (one screw) and brake (one screw) and the slide should come free. Drop the right end and move to the right.

Intertype: Disconnect the link at the right. Take out the two screws that hold the slide roll bracket just under the right side of the assembling elevator (we've given that thing a bad time, haven't we?), and the whole thing may be taken out. Don't lose the roll on the adjustable pin on the right end of the brake release lever. This can stand a drop of oil or a pinhead of grease.

Will an Extra Spring Help Return the Slide?

QUESTION: I have seen a machine with an extra spring on the right end of the assembler slide. The operator claims this helps it return. Should I try it? — S. I. R., Canoga Park, Calif.

LOOMIS: It is my impression that some machines have come so equipped from the factory. It is indeed a good thing, especially where you have lots of long lines. But first check all the things under *Why Does the Assembler Slide Fail to Return?* Then drill a 1/16" hole in the short connecting link that is fastened to the right end of the assembler slide, about ½" from the left screw head. The idea is to establish spring support in the angle formed by the short lever and the long lever (the one to the other end of which the spring is fastened).

Now about 1½" from the bottom end of the long lever, drill a hole in that lever. Use a keyrod spring; enlarge the loop ends; cut off or stretch so there will be a little tension when the assembler is at its extreme right. This spring will lift the slide as it moves to the left, and makes both right and left movements more smooth, and results in less wear on the parts.

Setting the Assembler Slide Clamp

LOOMIS: Cut a slug two points shorter than the measure you use on straight matter. Put on a new star wheel. Set the clamp so the short slug will just clear the star wheel and not stop it. This gives you a point and a half to play with, but don't fudge on it. Your star wheel will very quickly wear down a point.

MODEL 15 ASSEMBLY

How Can You Make a Model 15 Assemble Better?

QUESTION: We have a Model 15 in a small publication shop. It is a good machine for our use, but I cannot get it to assemble like a 5 or an 8. I wish you could suggest a remedy. – M. D. T., Lincoln, Neb.

LOOMIS: Gather round, students; you are about to be initiated into the secret that will unlock a Great Mystery. The 15 has always been a favorite of mine; in fact, some years ago I wanted a machine of my own for just such things as setting material for this book, and I bought a 15.

There was then the problem of assembly. I served my time on the old piecework machines in Texas, and I am not known for leisurely keyboard operation. I knew about the 15, having been asked this question many times, and I spent about three months working it out. There are basic differences between the 15 and others: the belt runs more nearly horizontal, the mats drop from a magazine more nearly vertical, the partitions are long and loose.

First I put on a Wm. Reid chute spring – the one with the movable tongue controlled by a flat spring. I got it set for height as I explained above in *The Chute Spring*, pages 63-64.

I checked over the assembler slide. I saw that all the belts were good, and I made sure the keyboard was turning at 275-280 r.p.m. The chute rail springs were replaced. (Mighty thorough, wasn't it?) I even checked the height of the assembling elevator, which you will do in the next chapter. The keyboard was clean, the magazine and mats were clean, and I sat down, confident. But an hour later I was groggy. At about three or four mats per second it worked fine. Over that it was terrible.

I watched the long, long partitions flopping around like the tail-end canvas of a covered wagon in a high wind. I studied the first guide. I got my snips

and whacked off about an inch from the bottom end. That was too much. I had to solder a piece of 1-point brass – about ½" – onto the bottom (on the outside, of course) to bring the end down to meet the chute spring. Then I spotted it and marked it. Took the guide to the bench and soldered a paper clip to the outside, 2" from the bottom, crosswise, and let about ¼" project at the back. Put it back in place and marked the spot where the end of the paper clip hit. Drilled a hole there with a 1/16" – No. 52, same as mouthpiece – drill. Dropped the clip in the hole. Now the first guide was stationary.

The second (short) guide was a little different, but it too was floppy. I soldered a paper clip to its right side, about 2" up, and set it in the middle between the first and third guides.

The third guide was too long. Eventually I got a considerable curve in the bottom, to bring the bottom edge about 18 points from the first guide and about 18 points above the rail springs. The fourth guide took still more curve. I cut off some again, and the end is about 1 pica from No. 3, and 18 points above the rail springs. The rest of them worked out as follows: all about 18 points from the preceding guide and about 18 points above the belt. The short ones were spotted in the middle.

All had to be cut off but the three short ones.

Now for the final adjusting. You won't have much trouble until you get over to the channel through which drops the lower case *u*. Here you will run into both the *m* and the *w*, and if you have set the bottom ends as far to the left as reasonable, you will still have some bending to do. Shut off the assembler and hold an *m* just above the belt. Release it gently and note if it goes through freely. If it doesn't, you'll have to bend a little or even cut off a fraction from the end of the No. 5 guide – but not much. (I also had some trouble with the *d* and the *h*, and some with the em quad. But be patient. The result is worth while. If the big mats do not drop through of their own weight, use a little bending, a very little cutting, and lots of patience.)

As a final test, sit down and run out all the mats in a channel by holding the key down with the finger; do this three times. Do the same with every mat that drops in that section. Just sitting there, watching fifteen mats pour out one after the other, you will invariably see a little ball-up if the partitions are not curved or spaced exactly right, and this will show you what needs to be done.

There is one further bit of corrective surgery that improved my assembly. I discovered the line delivery belt was running about 50% faster than on other models, so I got a 5" size B V-belt pulley and fastened it to the assembler drive belt pulley (by screws through the spokes). It throws the belt a little out of line but it has been running that way for four years and works fine.

Mine works like a charm. It is not quite as fast as some machines I have run, but faster than many.

CHAPTER V

THE ASSEMBLING ELEVATOR

QUESTION: The assembly on this machine is terrible. It never has been serviced, and there seem to be so many things wrong I don't know where to start. Could you outline a brief procedure for checking over the assembling elevator? — T. R. P., Bend, Ore.

HARDING: As with many other linecasting questions, it is difficult to answer this one briefly. It is not complicated, however, once you see all the angles, and an experienced machinist can rebuild most assembling elevators in a couple of hours, outside of welding worn spots, etc.

Side Play in Assembling Elevator

LOOMIS: First let us take up side play. The assembling elevator should fit snugly against the right side to avoid mats' catching in the crack. My first move is to loosen the four screws in the left hand gib. With a small screwdriver, pry the gib to the right and tighten the screws. If this doesn't do the job, and there is still too much "shake," take out the four screws entirely. Use discretion and pry the gib forward to release the pins. I have always been able to do this without removing the delivery channel. Drop the gib and take it out. Knock out the pins. You will find the screw holes a little large. Put the gib back on without the pins and try pushing it over and tightening. If there is still too much play, use a rat-tail file on the left side of each screw hole until you can tighten the gib against the assembling elevator. Now loosen all screws but the second one from the top. This is the most important one, for this is the most important position of the assembling elevator. Have this one tight enough to bind on the assembling elevator. With a linotype slug and a small hammer tap the gib to the left until the assembling elevator is just free. Now run the assembling elevator up and down a couple of times to square up the gib, then tighten screw No. 3 and try the assembling elevator again. You may do a little tapping. Now take No. 1, at the top. When you get through, see that you haven't lost your nice tightness at No. 2. If you have, you may have

to re-set No. 2 and do it over, putting this time a very little bend in the gib by tightening all screws, then holding No. 2 with a screwdriver blade while you tap No. 1 to the left. You can do this very easily if you have three arms; otherwise you need help.

Try the assembling elevator carefully several times. If it is perfectly free on the gibs (take off the small assembler entrance cover and the chute block, to avoid interference), and if it is still snug against the chute block when you put that back on, tighten the screws firmly. Personally, I like to put a dowel pin just above No. 2, but in the country you seldom have the tools to make a hole that fits. Those are ⅛" dowels, but it is seldom that a drill of that size will cut true. A No. 31 drill is .120" and will come close, but you may have to grind the pin a little. Otherwise you can use a ⅛" drill, then lay the pin on the vise and hammer it out of shape to make it fit. Or drill a pilot hole with a 1/16" drill, then go through with ⅛". Be sure not to move the gib while drilling and pinning. Try the elevator again afterward to be sure it doesn't bind. The elevator should fall freely by its own weight. Use graphite only on the slides.

To Remove the Assembling Elevator

HARDING: The entire assembling elevator can be removed. Disconnect the lever link at the bottom. Remove the assembler slide roller bracket (lower right, which holds the spaceband buffer), take off the assembler slide finger so you can swing the assembler slide out of the way; take off the small gib that guides the assembler slide just under the chute block, if there is one; remove the assembler slide brake operating lever, and the assembling elevator by now is on the floor if you haven't held onto it.

While you have it off, turn it upside down and examine the adjusting screw under the right end of the delivery slide releasing wire, if it is a Linotype. Find a small screwdriver that will turn it, and be sure that it does turn. It is much easier to free it in this position than it is when you are standing on your head.

Okay, you've had your fun. Now we'll dive into it.

Adjusting the Two Halves of the Assembling Elevator

LOOMIS: Pull down the assembling elevator gate. With a little-used pi mat, test the space between the two halves at the place where the toes of the mats ride. There should be just clearance here. Adjust with paper shims at the bottom. Get both ends alike. *Do not file either of the surfaces at the bottom.* Even the experts avoid this. You will find some already filed. Those you can

only work with until you get them right – but the bad part is that they seldom go together the same way twice. You could have it squared up on a shaper or a grinder and make a filling piece out of brass leads and 1-point material. You could also buy a new assembling elevator.

Let us assume that your surfaces are square. Now take out the one big screw and remove the front half, noting where the paper shims were. Oil them and stick them in place. Take the front half to the vise.

Now there a number of things to investigate. First take off the gate. (I assume you have the whole thing clamped in the vise.) Examine the matrix detaining plate on the right end. If broken or worn, it should be replaced. Take off the duplex rail cap carefully so as not to lose the small square filling pieces under the two screws. Carefully lift off the two duplex rails. Note that the right-hand end of the Linotype short duplex rail has a small pawl that extends upward. If this pawl has been broken off, replace the rail. Likewise, the long rail has a narrow extension on the left that frequently is broken off. If so, replace it. Emery cloth these rails and rub with graphite.

Under the rails may be a flat copper spring, very small round copper springs, or small springs with balls to act as detents. These are to hold the rails in place either in or out. Graphite the surface just under the rails, and the bottom surface of the cap. Replace.

Assembling Elevator Front Matrix Buffer

Take the front half out of the vise. If the fiber buffer is worn, replace it. This buffer is easy to replace but not always easy to fit. It is usually too thick, protruding above the rest of the assembling elevator. If so, take a sharp knife and peel off a point or so, or file it if you prefer. On an old machine you will often find the top edge of the buffer, where the mats ride, is higher than the adjoining rail. Use a sharp knife here to bevel it down, or you will have squabbled lines. Now there is one more place to trim – the right side (looking at it with the assembling elevator on the machine). This edge very often binds against the small assembler cover, and I file it down on principle.

Assembling Elevator Gate

HARDING: This too is tricky. If the right corner is gouged out by mats, you may need to smooth it with a file. Examine to see if the "legs" are straight and square – not spread and not twisted. Very often the assembling elevator gate roll stud is badly worn. Knock it out with a pin punch from the left, and put in a new one. The roll, if worn, should be replaced.

Now the pawl at the upper right. On old machines the pawl may be badly worn and need replacement. Sometimes it's the hole that's sloppy. On most pawls you can drill this with a 5/64" drill, and drill the gate also, then use 5/64" drill rod for the new pin — which must not protrude above the surface. Also, the tiny 1/16" pin against which the pawl banks may be worn out. Drive it out and replace with a piece of drill rod or a part of a mouthpiece drill.

The pawl should move freely, should not stick out in the way of mats, and should have just enough spring to keep it in place. Too little spring will not hold it up; too much will make mats jump out.

Put the gate back in place. Set the front half of the assembler aside.

Take off the back half as instructed in *To Remove the Assembling Elevator* above. Take care of the pawl the same as you did the pawl in the gate. It is only fair to say that sometimes you hit a hard one that you cannot drill, and for some reason this happens oftener on the back. Get a new pawl and pin.

Watch out for the tiny compression spring behind this pawl. Replace the lower matrix detaining plate if needed. This is held by a special small-headed screw which must be used. Anything bigger will rub against the chute block.

There is a steel matrix buffer in this back half. If this is worn, it must be replaced.

It is worth emphasizing that the front fiber buffer, when allowed to become badly worn, throws the burden of receiving the mats onto the back steel buffer, which burrs the toes on the casting side of the mats. The mats on the right end of the line should not tip forward when you open the assembling elevator gate.

Setting the Assembling Elevator Gate

Loomis: Put the assembling elevator back in place and together, and test the bottom clearance with that pi mat again. If it has changed, do it over. It should not have changed. Now let's set the gate. First be sure the assembling elevator gate hinge rod is not worn on the ends. Replace it with any 5/32" stock for the moment. If the holes in the legs of the gate are worn, you can peen them, but it's a messy job and won't last. Peen them on the back edge if you must.

The gate banks on a stud at the left side and on the head of the screw that holds the matrix detaining pawl on the right. Usually the screw head takes the burden of adjustment. Using your pi mat just to the left of the pawls, try for the same clearance you have below. Usually there is no clearance, and your only recourse is to peen the head of the screw on the front side with a small ball pein hammer. This too is messy and somewhat temporary.

If your gate is worn in the holes or otherwise decrepit, I strongly advise a new one, and I much prefer those with adjusting screws on the front, so you don't have to depend on the screw head.

After the right end of the gate is set, try the left end. There may be six points' difference between the two ends. Miomi! This can be mayhem, but it needn't be. (This seldom occurs with a new gate.) Take a screwdriver with a 6" blade and stick it through the gate diagonally. If you don't play Atlas, you can bend the gate to exact evenness. But remember, that screwdriver is big. You can break the legs off of the gate unless you say when.

You may now have a mysterious bind. Be sure the hinge rod is not too long or not sticking through on either side. Sometimes the left leg of the gate is twisted so it binds against the line delivery channel. There is not much clearance there.

Whot is the Proper Height of the Assembling Elevator?

LOOMIS: This is another measurement that I got from Frank Phillips of Teletypesetter. The correct distance from the top of the bottom inside rail of the back half of the assembling elevator (the rail on which the mats stand in light-face position) to the bottom of the "button" on the assembling elevator stop bar banking plate (the assembling elevator cushions against this button when you send up a line) should be 5 9/16". By taking off the front half of the assembling elevator, you can measure this distance accurately. You will note that it is determined by the elevator's coming to rest on the end of the assembler slide brake operating lever. This may get beaten down and increase the distance, or it may be peened out by somebody else and the distance decreased, or very often a new one is too thick. At any rate, this is where you set the height of the assembling elevator.

Finol Adjustments on Assembling Elevator

HARDING: Now our assembling elevator is set for side play, for mat clearance, and for height. Let's see if we can persuade it to send the mats into the delivery channel.

Note the hook on the left side at the back. Loomis should have told you to check the hook and the spring which operates it when you took off the assembling elevator, so let's hope the spring is okay. It usually is. But the hook may be rounded so it doesn't hang on up above. It must do that to prevent the elevator from dropping before the mats get out. If it is rounded,

file it square. If this takes off very much, you'll need a new one, for then it won't hold the assembling elevator high enough as the mats go across.

While you're at it, take out the one screw that holds the assembling elevator stop bar banking plate up above. This little strip will go on upside down, but in that position will not allow mats to be delivered in the bold face position. Some otherwise Christian men have resorted to strong language over this little gadget. Now take off the stop bar itself and note the spot where the hook catches. If this is battered and worn, order a new one. Replace the parts.

Note the ratchet at the upper right. This holds and releases the line delivery. Put a small dab of grease on the ratchet teeth.

Now back away the line delivery releasing wire adjusting screw in the bottom of the assembling elevator which you were told to loosen previously. See that the wire is straight. It is 1/16" in diameter and should be steel wire. It is set in a brass bushing, and if you get hold of the wire with a pair of pliers, usually the whole works will come out. Back off the adjusting screw a couple of turns. Now send up the first elevator until it banks against the button. The hook should catch firmly in this position, and should not allow the assembling elevator to drop more than a point. While the elevator is suspended by the hook, turn up the adjusting screw until the releasing wire trips the ratchet and releases the line delivery. This should be just about right.

Replace Spaceband Buffer When Warn

Loomis: It is hardly necessary to say that the spaceband buffer, below the assembling elevator proper, should be replaced when a hole starts in it. This will materially improve assembly. And now, with the assembling elevator all set, we dive into the next chapter and try to find out how to make a machine assemble properly. The subject of transpositions comes up — and there are a lot of answers.

Newer spaceband buffers are made with a hump that drags on the bottom end of the band and therefore causes the top end of the band to slant to the left, thus allowing more room for the next mat to enter.

CHAPTER VI

TRANSPOSITIONS AND OTHER ASSEMBLY TROUBLES

Harding says this is "a little subject with a big answer," and I am afraid he is right. Nevertheless, we can break it down considerably.

One of the major trouble areas is in the keyboard.

Keyboard Transpositions

Anything that causes or allows erratic action of the cams will result in transposition. See *Delayed Action Response,* page 13. For a quick check, here are reminders (these items are covered previously; this is merely a check list):

Free end of the cam yoke may be gummy or burred; trigger gummy; kink in the hinge wire; overmotion spring (on Linotype) rests on top of the pivot end of the cam; dry cam; cam teeth filled or worn smooth; cam rubbing on stop strip teeth; glazed rubber roll; belt slipping; friction pulley slipping on rubber roll shaft; grooves in the rubber roll which reduce diameter and make some mats fall faster.

Keyboard causes can of course go on up through the keyrods and into the verge rack or the magazine itself. And remember that anything that makes a mat drop fast will have the same effect as something that makes it drop slowly. The keyrods should not bind in their guides. The keyrod should strike the verge squarely. Magazine and matrices must be clean and in good condition. The big trouble is that many things that usually cause mats to fail, often merely cause them to hesitate; this makes them hard to spot. A sprung magazine or bent mats can cause transpositions.

Watch the speed of the keyboard. Over 275 r.p.m. you may have transpositions with the heavier mats. Note that normally the capitals, falling a shorter distance but traveling farther on the belt, reach the assembler about the same time as the lower case.

Verges must be free and must have sufficient spring tension to pull them promptly back into place. The assembler entrance plate and guides must be

set so mats come smoothly, with support from the plate, and without striking the guides.

Matrix belt should be fairly square at the edges. Assembler entrance covers must be properly set.

The matrix catch spring should be free in its slot. When it is pressed to the left side, it should be level with the surface or below.

The chute spring must allow thick matrices to pass freely. It also must be set high enough (vertically; not in relation to the chute rail springs) so that it will not retard the tops of matrices momentarily as they go into the assembling elevator. This can be observed with the unaided eye.

The star wheel, if worn, may fail to push mats inside the pawls, thus allowing a second mat to jump over.

Other causes: star tension too weak, allowing thick matrices to hold back momentarily. Insufficient tension on assembling elevator retaining pawl springs, so the mats sometimes fall back. Weak brake spring, whereby thick mats are driven too far over and then tip to the right.

Spaceband Transpositions

These may be due to any of the above causes, but spacebands have eccentricities peculiar to themselves. See *Spaceband Transpositions,* page 92.

Machines Using Large Mats

On machines using 18 and 24-point display mats, the large mats will necessarily come more slowly, especially if from an auxiliary. Allow for this. If a newer machine, the star wheel may be slower, or it may be the big size or a three-cornered one. These do not seem to assemble 6 and 8-point as well as the old style. The plain fact is that no machine will assemble 6 and 24-point with equal facility. Go slower on your keyboard work on the small sizes — and don't forget to set your chute spring up and down according to the size you are using.

The Sennett Positive Assembler

QUESTION in *The Graphic Arts Monthly*: We have a machine that regularly gives us twenty transpositions per galley, no matter how careful the operation. Two different operators run it, so it does not seem to be a human fault. We have tried everything — even bringing in two professional machinists — without much relief. Would a Sennett Positive Assembler, from the H. B. Rouse Co. at Chicago, be worth the money? — I. T. T., Tazewell, Va.

It is true that the Sennett assembler is a good piece of machinery. While most machines yield to the treatment prescribed here, and while that should be given first (for if there is a keyboard malfunction, the Sennett assembler

can't help much), sometimes they don't. In such cases I recommend the Sennett, which brings the mat closer to the star wheel via the belt, as on newer Intertypes.

HARDING says he knows from experience that there are times when the Sennett Positive Assembler is the only answer — but, he adds, check everything else first. It is possible to install a Sennett and still have trouble because the reason is elsewhere.

When Absolutely Everything Fails

QUESTION: We are having a young war in our shop. Our night operator gets along fine, but the day operator has transpositions. He constantly readjusts the machine; then the night operator adjusts it back again, and the day operator accuses him of sabotage. Something has to be done or we are going to lose an operator. How can we stop these transpositions? — S. B. C., Salida, Colo.

LOOMIS: This is a question I am glad to answer on paper. It is difficult to answer personally, for the fault is human.

Take a baseball pitcher. His case is easily seen because so much depends on him. One day he has his stuff; the next day he hasn't. It is the same with operators. Over the years I have heard many complaints about transpositions, and have tried conscientiously to correct them. On a certain large paper where I was night machinist a night operator complained at intervals. One week he was particularly disgruntled, and one night he almost walked out. I assumed (as do night machinists everywhere) that the day side was screwing things up. I'd get it fixed and the night operator would say it was fine, but the next night — bang! no dice.

One night this operator very nearly walked off the floor. I was extremely busy, and I told him I'd fix it after he left. But I forget it. The next night he had a grin on his face. "It's wonderful!" he said. "You really hit the trouble this time." I kept discreetly silent, but I was curious. I found out the machine had not been used or touched during the day. So the machine that night was exactly the same as it had been the night before! Then what had changed? The answer was inescapable: the operator was different.

Since then I have observed many operators. Without any desire to be tricky, I have tested them and kept the results to myself. I have also watched my own operating, for I have held many machinist-operator jobs, and I have many times found that one day I was bothered with transpositions, the next day none, the next day bad again — and in the meantime no one had touched the machine.

This was the final proof: the teletypesetter. I have seen a machine run for hours on teletypesetter without a transposition, but stop the tape for one day and put the machine into manual operation and you have transpositions, and

the teletypesetter is blamed, but put the machine back on tape the third day and there is no trouble.

I have gone into this at length, for it is hard to convince a good operator that he has off days. The difference is subtle, and crops up only with something demanding, like ball pitching or operating. The secret of good operating is rhythm, which means even spacing between letters. The teletypesetter does it perfectly. It is mechanical and not subject to off days in timing. Humans are. After operating teletypesetters, I am convinced that most of the transposition trouble is human — given, of course, a machine in reasonably good shape. That does not require a keyboard overhaul every three month. I have seen teletypesetters run for three years without even a keyboard cleaning. The one essential thing is that the machine be in good shape to start with. The teletypesetter installation men know that and take care of it. (All this is contrary to what many "authorities" say, especially some members of the I. T. U., to which I have belonged since 1922. But they have a cause. I do not. I am interested only in facts.)

Therefore, if your machine has been running well but suddenly starts transposing and jumbling, give it a chance before you start overhauling. Transpositions do not develop suddenly: they grow — if mechanical. If they start suddenly, the fault probably is you — and you needn't be embarrassed.

Oddly enough, a hangover is not as productive of this situation as some other factors. I am not a psychologist, but I know that emotional turmoil or tension or whatever you want to call it, will cause this trouble. It is worth noting that sometimes the reaction is delayed for several days; it is also true sometimes you cannot trace the origin. Sometimes an operator is just "off," and sometimes it lasts for several days. However, when excessive transpositions go over two days, give a thought. Did they occur abruptly, or have they been growing?

There is a remedy for this even when caused by the operator: slow down, be deliberate. In a couple of hours, very often you will be back in the groove and can gradually increase speed.

It is only fair to note that Harry G. Pottle, writing in *Who's Who in the Composing Room,* does not entirely agree with me, for he says "a machine operated by a teletypesetter will also transpose at times." This is true — but I do not think we are as far apart as it might seem. He goes on to say that "a new machine with new matrices will set perfect proofs if its escapement and assembling mechanism are adjusted properly." I agree that any machine will transpose at times, but when these times become more than two or three an hour, it is too much, and when it develops abruptly and without warning, it is likely due to the operator — and I think Harry will agree with me. I have always been most loath to blame troubles of this nature on the operator, as I think a good many operators would testify; it is only in the last ten years that I have become convinced that a certain type of transposition is due almost entirely to an off day.

Why Do Mats Jump Out of the Assembling Elevator?

QUESTION: Within an hour of operation, at least twenty mats will jump out of the assembling elevator. I have let them lie on the floor for an hour just to be sure, and have picked up that many. This is getting my goat. Can it be fixed? — O. S. S. C., Montgomery, Ala.

HARDING: Indeed it can. Anything, of course, that causes transpositions of mats or spacebands will cause a certain amount of jumping out, but there are other things to check first: strong star wheel, weak brake spring.

If the operator customarily allows the assembling elevator to fall unsupported, the brake release operating lever will become pounded and allow the assembling elevator to seat too low; this will cause jumping out.

LOOMIS: What Harding says is correct, and I have only emphasis to add. Within my experience, most of this trouble comes from two causes: 1, too stiff a star wheel; 2, the assembling elevator gate is too tight or too close to the back of the assembling elevator. Occasionally the assembling elevator pawls are unusually strong and do the same thing. The gate must be set so there is clearance for a new mat — about .005" space. The star wheel in normal operation slips a fraction when it hits a mat, and gives the mat a chance to settle. If the spring is too strong, there is no slippage, and the mat may get thrown a couple of blocks.

Otherwise, all the factors pertaining to assembler, assembler slide, assembling elevator, spacebands (which are treated in the next chapter), and keyboard, verges, magazines, and channel entrance partitions, are pertinent. Anything that delays a mat momentarily may cause jumping out as well as transposition.

Observe: If the peripatetic mat is always the same letter, look in the keyboard or above. If they are fairly well scattered, look to the assembler functions.

Mats Clicking on the Way Down

LOOMIS: One last word: On a machine where mats jump out or transpositions occur, you will sometimes hear an erratic clicking as the mats fall. It does not occur on every mat, but occasionally or frequently. It's a click louder than the usual steady dull click of mats falling normally, and if you listen you will easily detect it as you set type. This indicates that mats are hitting an obstruction which slows them down until they are hit by the next mat. With only a sixth of a second between mats, there is no time for loitering.

Look first to the small assembler cover and see that it does not protrude past the edge of the large one. See that there is not too much space between

the large cover and the matrix delivery belt support plate – preferably not over six points. Be sure these mats are not catching at the upper ends of the chute rail springs. Also, if your entrance guides at the lower ends have at some time been bent unusually straight, a mat may drop straight down, get smacked by the belt, and be tossed up against the next guide. By this time a later mat can hit it. The guides should be curved at the bottom to usher the mat onto the belt with ease.

Most of these points have been covered in other connections, but are worth repeating here in answer to the question.

When the First Mat or Usually a Heavy Mat Jumps Out

Loomis: This indicates loose brake spring, no assembler buffer at the right end (allowing the assembler slide to bounce back and leave a crack), too much speed on the mat delivery belt (I prefer the delivery belt to run below 600 r.p.m.), or lack of adjustment of the chute spring.

In regard to delivery belt speed and rubber roll speed: on most machines these are set so that if one is right, both are right – unless they have been changed later. (Sadly enough, this often is the case. If m-o's did not fool with machines, life would be much simpler. Also, perhaps they would not be human, but flying saucer pilots. Nevertheless, I once knew a woman in Deadwood, S. D., who had been the sole operator of a Model 8 from the day of its installation, who had no wrenches and only one tool – a screwdriver that never had been used for anything but changing liners. The machine was six years old when I got there, and her only complaint was that two letters didn't always drop!)

When I got my Model 15 running at 6½ lines a minute, with a 4" pulley on the intermediate shaft, the keyboard rolls were doing 350 r.p.m. and the mat delivery belt pulley 750. The proper place to correct this is at the intermediate shaft pulley, but what I wanted – a 4½" or 4¾" – was not available, so I used V-pulleys and cut down the two speeds separately. The rubber rolls now are 300 – not what I aimed at but probably all right, for the magazine on a 15 has more slant – and the mat delivery pulley is turning 535. This may not be the final word, but she is beginning to feel like a real machine.

CHAPTER VII

SPACEBAND BOX
SPACEBANDS

QUESTION: I am having all kinds of trouble with the spacebands on my Model 14. It has given good service for years, and I have never touched it, but now the bands fail to drop, and I find them jammed up above. Can you give me a briefing on spaceband boxes? — A. P. L., Monticello, Ark.

The Linotype Spocebond Box

MACD. SINCLAIR in *Printing Equipment Engineer:* Let's look at the action for a minute. The spaceband keyrod raises the key lever, which pivots just back of the face plate. As the key lever goes up on the right, it goes down on the left. The spaceband box pawl lever drops, and lowers the pawls below the ears of the bands. The pawls then move under the ears, impelled to the left by the small flat springs. The key lever then raises the pawls; the band is lifted clear of the spaceband chute plate (it has a curved upper end against which the bottom end of the spacebands rests); the ears are lifted above the ears of the spaceband box rails; the bottom of the band swings to the right, and the spaceband slides off the lifting pawls and drops.

When trouble develops, it may be wise to take off the box and look it over thoroughly.

To Remove the Spacebond Box

On Linotype or Intertype, shut off the clutch, back up the machine, hold the spaceband pawl with the right hand and depress the transfer slide releasing lever with the left (this is ordinarily depressed by a screw in the second elevator head), and let the spaceband pawl go to the left. This gets the pawl out of the way and also avoids losing the spring. Take out the one large screw in the center of the box, lift out and up to clear the pawl lever adjusting screw (split head) from the key lever, and take the box out.

Remove all bands and take the box to the bench. Now there is a systematic way to go at a spaceband box, and generally when it starts giving trouble you are better off to act as if you are rebuilding it. For this, let us have a symposium by SINCLAIR, HARDING, and LOOMIS:

Worn Holes Where the Shaft Works

First, take the pawl levers and their shaft. If the shaft is extremely sloppy (hole elongated as much as two points), you will have to use 17/64" steel rod to make a new shaft, and drill out the enlarged holes to 17/64", as well as the holes in the levers. Pins, preferably taper pins, must be driven in to keep the levers constant in position. Keep them as nearly even as possible. Graphite the shaft before putting it back.

If you do not replace this shaft, see that the levers are firm and fast on the shaft, with taper pins solid.

Installing New Spaceband Box Rails

While the shaft is out, take the front plate off of the distributor box and examine the rails. If they are pitted or corrugated down near the ears, you can in emergency smooth them out with a small hand emery stone, but if we are going to do a good job, let's install new ones. While the old ones are off, emery with fine (00 or 000) cloth the surfaces where the lifting pawls work up and down; then rub in graphite with the fingers.

Watch out on the installation of new rails. New ones don't always fit perfectly, and sometimes they bow out in the middle. It takes very little to impede the passage of the bands. As you screw each rail in place, hold it up to the light and be sure it is flat against the surface of the box. See that the screws do not protrude. Okay, put the two sides back together. By now you have taken off the centerbar on top. Use a new band to test clearance between the rails. There should be clearance. When this is established, put the shaft back in and pin the lifting levers on it.

Installing New Lifting Pawl Springs and Screws

Put on a pair of lifting pawl springs. These are very fussy about the bend. Looking at the front one, and starting at the fixed end, bend the spring to the left, then go out a pica and bend it back to the right; then to the left. Where you get through, the outer end should be a couple of picas to the left. A strong spring here is better than a weak spring.

The long lifting screws should be renewed. Sometimes they are too long and have to be ground about six points shorter to keep bands from hitting against them.

Where old screws have a groove worn in them, lifting pawls often get bound between the grooves and the box rails.

Now, with the gate off, take your new lifting pawls and set them in place. You can do this without removing anything else. See that the springs are in

the slots, and try the lifting levers up and down. There should be no roughness in the movement. If there is, look for a spring rubbing against the shoulder in the hole. Be sure the pawls are free. (You cannot make this test for free movement without the pawls, for the springs will bind against the hole.)

Now graphite the pawls carefully and shake off the loose graphite. Put them back, and clamp the box carefully in a vise, so it is straight up and down. Try the lifting pawls once more to verify free movement. Sometimes a pawl is bent. On rare occasions a rail will curve in and bind the pawl.

Setting the Center Bar

Check the center bar. If the two small lugs are rounded on the under side, square them with a small file with a safe edge. These prevent the second spaceband from rising. Put on the center bar and put two new spacebands in the box. Set the bar so the lugs miss the first band by about half the thickness of the next band.

Adjusting the Lifting Pawls

Get your eye on a level with the tops of the pawls and raise them slowly. They should be even. (On rare occasions two unmatched rails will not be the same height, as I discovered recently, so you cannot always go by those. In that case you have a very tricky situation. Always install these rails in pairs—LOOMIS.) If the pawls do not come up evenly — and they probably won't — you will have to get rough again. With the box firm in the vise, use two screwdrivers, one to pry up on the lever that operates the low pawl, the other to pry down on the other lever. These are malleable unless you get into some made of white metal. If you have done a good job of installing the new shaft, you won't have to bend much. On a machine where you merely install new pawls, you likely will have to bend some. Get those pawls the same height, then put the two bands back in — or did we take them out? Lift a band with the pawls, s-l-o-w-l-y, and watch the ears of the band fall off the pawls. They should come off at almost exactly the same time. If there is an appreciable difference, the band will swing and drop crooked.

Now make another test. How far in do the pawls go? There are two schools of thought on this. Some favor making the pawl rise exactly between the two bands. This is fine but it's difficult. It is easier to make the pawl rise somewhere in the middle of the ear. If the pawls are properly set, this will also lift the last band out of the box.

Obviously if the pawls extend in too far, they will bite at the second band. They usually do, on an old machine. There are several ways of correcting this. Heating the pawl for bending is good, but difficult for the m-o, for it involves re-tempering. Some peen the inner edge of the pawl, but perhaps the most satisfactory way for the m-o is to lay the pawl, inner edge down, on two 12-point

slugs and tap gently with a small hammer until you produce a slight belly. This provides a new bearing surface and brings the tip of the pawl back. Go easy; pawls vary in bendability.

Now the pawls are riding freely, they come up evenly, and they do not take a bite at the second band. The center bar is set to retard the second band if it tries to rise anyway – which it will if the bands get dry and un-graphited.

On an old box that is just a little sloppy, always test for height by lifting up the back lever while holding down slightly on the front lever. This means, in the long run, that the front pawl will be a little higher when not under pressure, but since the motive power comes from the rear lever, this test is correct as outlined.

On old machines, with lifting pawls worn flat on top and no new ones available, you can grind the beveled surface and get new points, but you will have to adjust the pawls more carefully than new ones, and you will still have old pawls. Better wait until you get new ones.

The Spaceband Box Chute

The two side pieces of the chute are beveled at the bottom to throw the top of the band to the right. If these beveled extensions become badly gouged they should be replaced.

The tongue in the bottom of the long chute plate should be bent to the left from six to twelve points. Too much will throw the band out of time with the mats; none at all may cause transpositions.

Setting the Short Spaceband Box Chute Plate

This is simple but important. The free bottom end of the short plate is to set to allow your bands easy passage. (We assume your bands are all the same thickness; otherwise you must set it for the thickest. Likewise you may have to change it if you change sets of bands.)

Now for the curve at the top. If the plate is old, take it off and see that the flat surface at the very end, against which the bands will rest, is smooth. If not, file or grind – as little as possible. Try the plate with your fingers for malleability. This applies especially to new plates. If it seems brittle, be very careful. It is most embarrassing to break one of these without a replacement. (It will take only about three hours to make one out of a sheet of brass, if you can find the brass. – Loomis.) Screw it in place. Now you can set it for height.

With a new band, or with a band whose ears are not appreciably worn, this lip should catch the lower end of the band by 3/64" to 1/16". More will hold back the bottom end of the band while the top goes on over. Less will

mean that some bands will get bounced over at the bottom, and there will be a jam-up the next time the pawls rise.

A word about bending: To raise this lip, use a small screwdriver from underneath – but *take it easy*. Too much is enough. To lower, use the small screwdriver underneath to brace it, and put another screwdriver through the slot in the long chute plate and pry on the top end of the short plate. Here, most emphatically, don't play Hercules, for you are not giving the plate much of an arc to absorb the bend.

If the top end of the band goes over all right but the bottom end stays behind the chute plate, then the chute plate has too much bite. Harding says you should not bend this plate without removing it from the chute – and that is indeed safer.

Spoceband Lever on Model 1

Here the lever (the long one that goes behind the face plate) was soldered at the hub. This solder would come loose and cause endless trouble until the thing was resoldered.

Right End of Spocebond Lever

The hole in the right end usually wears larger and elliptical and causes lost motion. Drill it out with a larger drill (about 3/32") and drill out the hole in the spaceband key rod. Insert a 3/32" cotter pin. A drop of oil on this joint once in a while will preserve the fit for a long time.

Spacebond Keyrod Worn ot the Bonking Bar

Very often on old machines the spaceband keyrod (the long vertical rod) becomes badly worn at the notch where it banks on the banking bar. Sometimes it drops the rod as much as a pica – which is too much. Get a new rod – or, in emergency, rivet a piece of an old rod on above the notch and extend down just far enough to provide a new banking surface in the right place.

Two Springs Affect the Keyrod

There is a spring on the spaceband "weight" below the keyboard cam. This spring counterbalances the weight of the spaceband key. It should be just strong enough to pull the weight firmly down after each stroke. Too much stiffness will make the spaceband key "hard." Too little will make doubles.

There is also a spring to pull the keyrod down, counter-balancing the weight of the spaceband box lifting levers and pawls. This too should be just strong enough to do a positive job. Too much strength will wear a groove in the rubber roll. Too little will leave it up, and you won't get your spacebands.

Replace the Box and Test It

Put the box back in place. Lift the lifting levers and let the end of the key lever slip into the slotted screw head. The key lever should not bind on either side. It is easily bent a little with the fingers until it rides in the center. Put a dab of hard oil on it. Now turn off the power. Hit the spaceband key and turn the roll by hand. At the low point of the left end of the key lever, it should have a little play between itself and the bottom of the slot in the screw head.

At this point also, the lifting pawls should be at least 1/32" below the ears of the bands. Keep turning the rubber roll slowly. The lifting pawls should lift the first spaceband evenly, and after it swings off, the tops of the lifting pawls should be at least 1/32" above the tops of the ears on the spaceband box rails. Most machines show a considerably wider range than this 1/32" above and below, but this won't bother.

Bands Fail to Drop

When one ear hangs back, open the gate and try the pawls by hand. Pull them to the right and see if they snap back promptly. If not, they may be rusty, gummy, or bent, or the spring may have no zing. A good test, with the box off, is to hold it with the pawl side down. Pull the pawls down by hand and release slowly. They should go fully up into place in this position.

Double Spacebands

For double bands, be sure it isn't the keyboard cam. Tie a white flag on the keyrod where you can watch it from the corner of your eye. If you get doubles not from this source, sometimes they will fall as a double and sometimes they will clog up in the chute. This means the pawls are going in too far, the center bar is not set properly, or the lip on the short chute plate has not enough bite. This also is caused by unevenness in height of the pawls.

To Test Assembly of Spacebands

Loomis: The final test of the way the spacebands drop is this: standing as far away as you can, hold your finger on the spaceband key and let the bands come tumbling down. Keep your eyes focused on the spot just above the right end of the assembling elevator gate. Do this several times, until presently the continuous dropping of the bands seem almost like a steady flow of water, and the path of the bands is very clear in your mind. (Frank Phillips maintains this test cannot be successfully made without three drinks of scotch, and I am not a man to dispute an authority.) Matter of fact, you have to concentrate on this until you forget everything else, and the only thing in your

consciousness is that almost solid stream of bands, falling, falling... You are half hypnotized by it, but when you are, the path of the bands is as clear as if it were drawn on paper.

The band should drop until the ears hit the bottom of the spaceband chute; then the band suddenly moves straight left about half an inch, hangs poised there a fraction of a second, straight up and down, then drops neatly into place. This is what you are striving for. Keep working until you get it.

To Test the Spaceband Box

LOOMIS: I have found this almost failure-proof: hold down the spaceband key and let all the bands drop (excepting the last one or two). Do this four times. If there is no failure except the last one or two in the box, you can feel pretty sure it is working.

The Intertype Spaceband Box

SINCLAIR, HARDING, and LOOMIS: Up to the spaceband box itself Linotype and Intertype are similar. But in the box there've been some changes made. The rails are entirely different, without ears. There are no lifting pawls. In the back plate, near the bottom, a plunger comes out and pushes the first band toward the front. It then swings into the chute and down.

There are a few adjustments in this box.

Detaining plate, on the front of the box, should be set to cover half of the second band, to prevent doubles. This adjustment is made when the releasing pawl has receded and the band dropped down against the banking pin.

Keep the floor of the box free of caked graphite.

Occasionally take out and graphite the releasing pawl and the pivoted lever that operates it.

Sometimes the banking pin becomes rounded and allows two bands to drop at once. Remove the releasing pawl and with a pin punch through the slot, knock out the banking pin.

The tension of the releasing pawl spring must be positive.

A rivet protruding from tbe band will stop delivery.

The center bar on an Intertype box is to depress any wedges that are inclined to remain up on the sleeve.

Sometimes the spaceband key lever is bent so that even at its lowest, the plunger will not recede enough to clear the spaceband which is about to fall against the banking pin. The lever can be bent with care.

LINOGRAPH SPACEBAND BOX

The point of the hook on the front ear of the spaceband box pawl on a Linograph is slightly lower, because there is but one lifting pawl.

SPACEBANDS

Can We Mix Different Sizes of Spacebands?

LOOMIS: You can, but it can be frustrating, too. If you use thick bands at all, the center bar lugs and the bottom end of the short chute plate must be set for them. They generally will not then function on thin bands. Some sets of mixed bands, however, are used, and sometimes, when conditions are right, the two sizes drop with equal facility. This is an exception.

Spacebands With Badly Worn Ears

QUESTION: The ears of some of my bands are worn narrow, top to bottom, but they seem to work fine. Is there any point in replacing them as long as they work? — O. T. R., Red Oak, Okla.

LOOMIS: Perhaps not, but ears considerably worn usually make trouble. The ear of a new Linotype spaceband (I have some unused ones here) measures .091″ (just short of 3/32″), and when they get worn down a couple of points (say to around .065″) you may expect trouble in two places: bands will be left in the transfer channel because the lugs on the spaceband pawl pass over them, and they sometimes fail to be lifted over the lip on the short chute plate. If you decrease this bite of the chute plate, you then put in a half dozen new bands and find that they bounce over. Ordinarily speaking, it is not good practice to put new bands with badly worn ones. I have many times found this at the root of spaceband trouble.

Cleaning Spacebands

One last word: Do not under any circumstances buff the bands against a cloth emery wheel. You can make them shiny, but you also round the edges.

Repairing Spacebands

LOOMIS: For some reason I have had very poor luck repairing spacebands or having them repaired. This has been consistent over thirty years, and I am inclined to think new bands are a better investment. I do keep good sleeves, but you seldom have an extra good wedge, and I have only rarely been able to put together a good band from these slavaged parts.

If you do salvage such a band, if you straighten one that has been kinked — which sometimes is difficult — hold the wedge up and see if the sleeve will fall by its own weight. It should.

A sharp kink is almost impossible to take out.

What Kind of Bands to Buy?

There are six or eight different thicknesses and tapers, and they vary from company to company. The kind most suitable for all around use in almost any shop is commonly called "teletype band." Its minimum expansion is around .037", maximum around .124". Thin bands are available for fussy composition. Jumbos are seldom used any more.

How to Use Bands

HARRY G. POTTLE in *Who's Who in the Composing Room:* Always run spacebands with the sleeves toward the right; they are .001" thicker on the casting edge. Two spacebands should not be used together, for there will be a small gap that encourages metal to cast against the side walls of the mats. Do not use spacebands at the end of a line – either end; this may score the wedges.

SPACEBAND TRANSPOSITIONS

Spaceband Falling Before the Last Letter of a Word

QUESTION: What makes the spacebands fall ahead of the last letter in a word? I have had this trouble for over a year, and it's getting my goat. – T. P. L., Moose Jaw, Saskatchewan.

HARDING: If this happens mostly on thick letters like *m,* be sure the chute spring is not set too close to the rails. Weak star wheel tension may do it. Too much tension will drive the assembler too far left, leaving the gap; then the right-hand mat may fall back to the right and allow the spaceband to get ahead of it.

LOOMIS: Quite often, too, this results from a peculiarity of the operator. Try lowering the spaceband key (which ordinarily is set a little below the level of the keybuttons). I have used a piece of wire, fastened under the screw on the front plate of the spaceband box and projecting inside, to in effect move the lip of the chute plate from ¼" to ½" to the left. This makes the band a little slower in dropping.

If a band is too slow, which happens infrequently, there is generally trouble in the box or in the keyboard cam.

Also, when the rubber roll is deeply grooved, this reduces the diameter and makes the cam turn faster. Likewise, if the roll creeps so that the cam rides on the corner, the cam soon will be turning over too fast.

SINCLAIR says that in some cases it is necessary to use an oversize spaceband cam. This is particularly true on older machines, many of which did not have an oversize cam at all. If your spaceband cam is the same as the other cams, order a spaceband cam. If yours is a spaceband cam already, it should be big enough. In rare cases where the m-o can't whip it, write either Company and

tell them you want the next larger size than a regular spaceband cam. There are a number of large sizes, some quite huge, but you won't want these. They are for machines with big sizes in the auxiliaries. With the next size, bigger than the spaceband cam, you may have to file out the stop strip to allow the cam room to turn over, and in some cases you will need a special individual stop pin – which will have to be fastened by drilling and tapping. Try to get results with the regular spaceband cam.

Why Do Spacebands Strike on Top of the Mats?

HARDING: Assuming the mats are upright in proper position, then the band either is dropping late or, more likely, is being thrown too far left by the tongue in the bottom of the spaceband box chute plate, by the beveled ends of the chute being worn out and perhaps beveling out instead of in, or even grooves here that hold the band unduly long until a stiff star wheel gets hold of it and throws it. The spaceband buffer can be a help here. The new buffers usually have a hump or two small flat springs at the right end, either of which is to drag against the band for an inch or so and tilt it to the left to create a little more opening for the next mat. This seems to be a good deal.

Why Do Spacebands Bend?

QUESTION: We have a three-magazine Model C that invariably bends a band when there is only one in a line. The lines are not always tight; sometimes the band rises an inch or so. We set a lot of short measure – 6, 7, and 8 picas – and our spaceband upkeep is much too high – A. O. J., Perryton, Tex.

HARDING: The justification springs (at the back of the machine) are set originally to handle ten bands in a line, and will not usually bend a single band. Sometimes, however, somebody has changed the tension. For the record, here is the way to check it. Let both justification levers go up; a spring scale hooked over the end of the first or right-hand lever should start it down at about 45 pounds; the left-hand or vise closing lever, 22 pounds. Newer Intertypes are set at 60 and 30.

Here is a good test: run in a line with over ten bands. Stop the machine after the first justification, and you should be able to pull up one band about ¼" with a button hook or a mat hook.

(LOOMIS: I have always liked this test, but at this last moment, on checking the *Intertype Book of Instruction,* I find the following recommendation: run in a long line with eight bands; you should be able to raise one only with difficulty after the first justification. Perhaps this applies to Intertypes alone.)

It is normal for bands to rise higher on the right end (reversed on quadders). Usually they are pretty even after the second justification. If there is too much difference (over 3/16", say) you can put a washer under the left end of the justification bar, over the bar brace. If this is done, you will have to grind the

washer considerably on the outside to keep it from projecting. (Note: This is Loomis's idea. Harding doesn't like it, and Loomis advocates it only when the top of the brace is unduly worn. The bands should *not* rise evenly on first justification. The line has to slide leftward to fill out, and the slanted justification bar assists this movement.)

In many cases of bending bands, the small lug at the top of the vise justification bar brace is unduly worn, allowing the left end of the block to rise higher on second justification, which causes a single band to skid to the right. Replace the brace.

Note that almost without exception, bands are bent to the right. This means it happens on the second justification.

Now if your springs are reasonably set (you can't soften them too much, for the machine will then fail to fill out long lines and you'll be sorry, for you'll have a squirt to clean up) and if your bar rises at a small slant on first justification and squarely on second justification, you may still, on a snug line with only one band, get a bent one. Now we resort to mayhem. Some m-o's roughen the bar with coarse emery cloth. Some hold it crosswise against an emery wheel and make very shallow grooves.

Chuckle by LOOMIS: We (and even Company men) were doing this in the field twenty-five years ago, but a book in my possession says in italic, "do not grind the bar." However, most new machines now come equipped with bars either stepped, cross-hatched, screened, grilled, or with small straight grooves across.

In justice, be thankful the engineers do *not* grab everything as fast as it comes along. If they did, you'd have a machine as big as Grand Central Terminal — and it would do everything but set type.

If you do roughen up a smooth bar, make shallow grooves, as narrow as possible and as close together as you can.

Why Do Spacebands Refuse to Settle Down in the Assembling Elevator?

LOOMIS: This is not a new problem. In *The Inland Printer* for October, 1900, a California man describes a wire which he stretched from the short finger to the long finger to "prevent sore fingers from pushing down spacebands." George B. Lincoln pointed out that such a device had been patented the preceding December, and suggested just what I am about to suggest: why not graphite the bands?

Except for bent or damaged bands, or bands that have been straightened when they should have been discarded, most of this trouble can be cured with graphiting.

On occasion the front half of the assembling elevator is canted in too far and binds the wedges, but this is easy to check. If the bands stick up for only the first four picas or so next to the assembler, and then gradually drop, the fiber buffer needs thinning. This happens often.

How About Grinding Bonds on the Bottom?

QUESTION: I have seen a Teletypesetter operating a machine in the city, and I noticed the spacebands were much more tapered on the bottom than usual. They said this made for better assembly. Do you think so? And does it hurt the band? — M. T. I., Sisseton, S. D.

LOOMIS: I have seen this done and I have tried it. I believe bands today are not as blunt as the old ones, so if you want to taper them, go ahead. Don't grind in too far, of course. It is my experience that the final taper should extend up to about ½" from the bottom of the band (no more) and that the very bottom of the band should never be over 8 or at most 10 points from a straight-line extension from the side of the band — in other words, the triangle of space at each side of the bottom will be about 3 picas by 8 or 10 points. I do not grind these flat, however, but a little rounded, so that the hypotenuse bellies a little into the triangle. Lay a slug along the side of the band to check the 8-point measurement. Finally, take off burrs and polish the new rounded surface with fine emery cloth.

How to Clean Spacebands

QUESTION: We have trouble getting the black spots off the sleeves of our spacebands. I have been told that Bon Ami mixed with graphite will do it more easily. What do you advise? — H. F., Norman, Okla.

LOOMIS: I have worked in a couple of large plants where the head machinist has tried different methods of cleaning bands, and have observed the results — which gives these conclusions a certain amount of statistical support.

First, I am compelled to say that I do not care for the spaceband-cleaning machines commonly used in large plants. They do not seem to do the job. I may as well go all out and take cognizance of the gadgets that have come on the market at different times (particularly one in the year of 1951), to be attached to the spaceband box. (The first automatic cleaner was made by Wm. Reid in 1900.) This latest one I don't know enough about to give an opinion at this time; some say it's perfect; others say they don't like it. It is always so with anything new — good or bad. My advice is this: don't stick your neck out. If the boss buys one, do your best to make it work. You never know. Maybe it's the answer.

But this is for those who clean bands by hand. Take a look at your bands on the sleeve side. There probably is a small dark spot at the casting point. This must come off. Do not use Bon Ami or any other abrasive, for it seems to round off the sharp edges of the band and encourage hairlines. I know a shop where they had to buy six hundred bands to replace those they had. They were using Bon Ami in the graphite, and cleaning bands every three hours, but still the bands would have large accumulations of metal at every cleaning time. They do not use Bon Ami any more.

Note one thing: if your bands have had large metal spots on them for any length of time, your mats are already hairlined, and that will encourage rapid accumulations on the bands. Sometimes it helps to get new bands, but more often you have got to get new mats also to get rid of the hairlines.

But let's say the bands have just a little metal on them. Scrape it off with a brass rule which is filed on the end to a square edge. Now rub the bands on a smooth, soft pine board. Use plenty of graphite. Rub the whole length of the band, and rub it until the black spot disappears. Rub the other side about eight strokes to polish it. Bounce off the surplus graphite.

Dixon's No. 35 flake graphite seems to be highly satisfactory.

Do not rub circularly. Rub straight, with the length of the band parallel with tbe grain of the board. Even rubbing on graphite makes tiny scratches which can help or hinder the sliding action of the band.

Use nothing but graphite. Rub both sides. Then drop the sleeve on one band at a time and rub the hitherto unrubbed spot on the wedge back and forth at the edge of the board. When the board shows ridges, get a new one.

If metal persists in accumulating on the bands, often it helps to get a tin of Notabur from Mergenthaler, and, with the tip of the tbumb, wipe a thin film of Notabur over the sleeve at the casting-point — after the graphiting. Or rub the spot thoroughly with oil before graphiting.

Return bands to the machine with the sleeve at tbe right always. Bands are tapered .001", with the tbicker edge against the mold, and if you run them backward it will encourage hairlines.

Under normal conditions, cleaning once a day is enough. But if they start to accumulate metal at noon, spend ten minutes cleaning them then also.

If you get a new font of mats, it is money well spent to get a new set of bands at the same time. Usually an old set of bands is pretty well bent up and the bands don't lock up squarely.

I do not touch bands with any sort of abrasive on a cloth wheel, either. Abrasives are out. You can remove metal and dark spots with a brass rule and graphite and elbow grease. Once they are clean, you can keep them so more easily by regular cleaning as described above.

In the nineties, coal oil was used extensively to clean bands, and still is in some places — but graphite is more satisfactory. In June, 1900, John Thompson noted a new slang phrase, "His space bands are rusty," probably meaning, "He's got a screw loose."

HARRY G. POTTLE in *Who's Who in the Composing Room:* I have been asked about using powdered mica as a substitute for graphite. I am very much opposed to its use on spacebands and would discourage my readers from using it.

Intertype jaws are center-milled for sure clearance of mats. The casting edge must be tight.

CHAPTER VIII

LINE DELIVERY

When to Replace Delivery Slide Long Finger Block

QUESTION: I have been told that the long finger block is badly worn and should be replaced. These are expensive, and I would like to know how you decide this. – R. E. C., Mendenhall, Miss.

LOOMIS: I replace this block in one of only two situations: 1. when the long finger is canted so far backward that it rubs against the assembling elevator when the line is sent up; 2, when the delivery slide bar (the one with the notches to set the long finger) is canted so far down that the clamp is nicked by the first elevator back jaw. I have seen some of these get pretty worn, but as far as I can see, if one of these two situations is not present, there is no point in changing the block. I'll tell you a secret: a new block invariably has to be filed considerably to work freely in the slide, and often after you've got it fitted, you will be dismayed to find it is as sloppy as the old one.

What Lubricant to Use

QUESTION: A young war is raging in our shop. The night man put oil on the line delivery slides, and the day man hit the ceiling. He insists nothing but graphite should be used. Can you settle it? – L. T. S., Mill City, Wash.

LOOMIS: The overwhelming consensus seems to be for graphite. I prefer it myself. I put it on with a toothbrush, and it seems to maintain lubrication longer than oil – which I have tried deliberately. One bad thing about oil: you put it on and it takes a long time to get rid of it, daily washing out with gasoline, etc. It seems to go into the pores of the cast iron and come out gradually. I have also tried kerosene, which doesn't last. I keep a squirt can with white, unleaded gasoline and graphite. This is a good way to apply it.

The Long and Short Fingers

QUESTION: Should the short finger be straight, or should it be bent? – T. D. S., Winona, Mo.

LOOMIS: The short finger on old machines works best with a little curve to the right, to avoid hitting mats as they go up.

The long finger should be straight up and down. The new split ones are good, but not applicable to machines with old style delivery carriage, though you can buy the whole works. If you use a split finger, don't make the long flat copper spring too strong, or it will push mats out of the first elevator jaws.

The small brass friction plate that steadies the long finger should be renewed occasionally. The large screw in the top of the finger is an adjusting screw for spring tension. There is a small screw inside that holds the brass plate. Also, the surface where the brass plate rubs should be graphited. Turn up the headless adjusting screw enough to provide definite pressure on the plate.

Long Finger Crawls to Shorter Measure

QUESTION: I am having a heck of a time. We have a Model 8, and I get the clamp set to hold the long finger at 13 picas. I send a line over and look up and the long finger is at 10 or 11 picas. This happens consistently, and I cannot understand it al all. — N. R. T., Thief River Falls, Minn.

LOOMIS: This can be tricky, but it's easy when you know. Either the line delivery slide block is worn and canted (see above), or, more likely, the small parts of the clamp are worn, allowing the trigger to fall enough to hit the first elevator jaw. The trigger will hit on the corner of the jaw and be jarred to the right; it will usually show a mark of this. The clamp can be repaired, but I suggest getting a new one. Then it will be good all the way around.

At this time also it is desirable to examine the delivery slide bar on which the clamp fits. If the bar is worn smooth in some of the grooves, or if some of them are deeply gouged — in other words, if you've had trouble with it — this is a good time to replace it. You will need also D-1404, Delivery Lever Link Screw. This is best installed by screwing in tightly and then drilling a small hole from the top of the bar and putting in a pin, but if you tighten it with a good screwdriver, it should stay.

How Can This Screw be Made to Stay in?

QUESTION: The screw that holds the assembling elevator releasing bar (the trailing piece) to the short finger block is always coming out. It hits on the spaceband box chute and gets knocked sidewise. Now the hole is so sloppy we can't make anything stay there. — P. F. T., Pocahontas, Ill.

LOOMIS: You have embarrassed me, for I have just looked up and have seen the same screw loose on my Model 15. (Believe me, *no* machine ever got such a checking as this machine is getting while I do my part of this book on the machine.) But this trouble can be remedied. Get a 10x32 shoulder screw (a bigger size may be needed if the hole is sloppy.) E-1466 is the number for the 10; and get nuts to match.) Drill the hole with a No. 20 drill; tap with

a 10x32; put the screw in place and see that the releasing bar is free to move up and down; otherwise you will have trouble with the line delivery, and it will be very hard to find. If the releasing bar is a little too thick at the end, file it thinner; it won't take much. Tighten the screw and put the nut on the end. That last sentence sounds simple but it isn't always. Blocks differ; often there isn't room to turn the nut, so hold the nut in a pair of Vise-Grip pliers and grind down the sides until it will turn. This is a lot of monkey business, but if you do it right you will be happy.

How Fast Should the Line Delivery Go Over?

QUESTION: We are up against the old situation — two operators and only one machine. One operator wants the line delivery to slam over; the other wants it to go over softly. They keep changing it back and forth and arguing with each other until I'm almost ready to buy a second machine. That of course is silly. Please tell us how it should be set. — T. D. S., Daggett, Utah.

HARDING in the *Graphic Arts Monthly:* I will have to limit my answer to "according to accepted practice," for it sounds to me as if this is an argument. The delivery slide should operate quietly and smoothly. I do not favor slamming or jerking. It not only makes for undue wear but it squabbles lines and damages mats and even causes front squirts. I am aware that when an operator gets into his stride he can be awfully frustrated if he thinks the thing is dragging. Yes, it is enough to throw a man off stride. However, he should accustom himself to the highest speed he can get without slamming.

While we're at it, see that the delivery lever link screw and the hole in the link itself (under the spring) and the delivery lever link stud in the other end of the link are not unduly worn. Let's eliminate all the slack we can.

Now turn the machine over past the casting point and stop it. Send the assembling elevator up without mats and release the line delivery. It doesn't matter how fast it goes over, just so it doesn't crack or bounce. Many air cylinders have had holes drilled in them to allow the line to travel very fast until it reaches the first elevator; this often makes the line delivery slam when it stops at the waiting point.

Take out the piston. Change the leather if worn. Otherwise oil it and oil the walls of the cylinder. Replace the piston. Graphite the line delivery slide. Try it again. If it still slams in the waiting position, cut down the air. If that doesn't work look for a hole, and plug it with a bit of chewing gum and scotch tape. (Well, we've used everything but baling wire.)

LOOMIS: I have encountered this difficulty more on Intertypes of certain years, and usually the solution is to get a new line delivery spring. Don't ask me why; I don't know.

Adjusting the Line Delivery Slide

There are two adjustments, one for the delivery stroke, one for the return.

LOOMIS: I set the screw in the left end of the face plate so the left surface of the short finger is 13/32" inside the first elevator jaws. Got that? It's easy.

I set the return at the waiting position of the delivery. Back the machine to the waiting position. My idea is to have the right side of the short finger flush with the right side of the delivery channel, so no mats can drop down. If you let it go in too far, it won't come back far enough to latch.

The setting, of course, is on the split hub at the back, with two ¾" bolt heads that are best reached with a socket wrench. Have somebody hold the delivery slide in position; loosen the bolts; tap the arm until the cam roll is against the cam; tighten; then examine. If you are too far to the left, have your assistant hold it a little farther to the right and try it again. Turn the machine over and be sure the delivery latches when it comes back.

If there is a lot of slack in the joints (sometimes the short finger will move half an inch back and forth), I usually set with the short finger pushed to the left, for it has to be in this position when it returns to be locked.

Replacing the Line Delivery Link

LOOMIS: The link (with a flat spring) is designed to come off under stress, such as a mat jamming the line delivery on the way back. It is not as hard to replace as it seems.

If the machine is at rest, reach over the face plate with your right arm and pull the delivery lever back about halfway, at the same time lifting the link to horizontal. The delivery slide usually is at the left. Lean away over and spot the screw that fits in the end of the link. Pull the slide to the right with your left hand. (This is one that can be done with only two arms.) Hold the link to meet it, and push them together. Snap! It's all over. Pretty soon you can do this by watching through the delivery slide channels, and later on without looking at all. Then you get a gold star.

By the way, if you have a Monomelt, wrap a wiping rag around your right forearm and it will be easier.

Adjusting the Line Delivery Channel

HARDING: The channel should be adjusted by shims if necessary until it is just wide enough (on both ends) to allow free passage to a new or pi mat in both light-face and bold-face positions. If you have time, file a gauge from an old liner. A new mat measures .5625", so your gauge should be about .570" to allow for older mats with slight deformities. This .570" gauge, however, should fit the channel snugly.

The channel must be aligned with the first elevator jaws – in or out as necessary.

The rails themselves are adjustable right and left. I have never seen them give trouble on the right, but they must be adjusted on the left, so that at least the thickness of a piece of newsprint is between them and the first elevator jaws.

Here's how: After setting the channels for passage of the mats, take out the two screws and take off the delivery channel assembly. (If your machine has a universal ejector, be sure to unhook the indicator rod and drop it out of the back channel plate first.) Now, with the assembly removed, you can loosen the three screws holding the back delivery channel rail. Turn them up again lightly. Replace the assembly. You can then tap the back rail either way, and when you get it set, take off the assembly and tighten the screws.

Loomis: There comes a time on old machines when you cannot get the delivery channel far enough to the rear to align with the first elevator jaws. Usually there is space between the back rail and the face plate, but you will have to take off the assembly and grind a little from the upper boss of the plate, first driving the pin back and making shallow depth marks with a three-cornered file for your guidance in grinding. Usually .005" is enough. If you take off too much, restore it with paper shims. This is a tricky job but often necessary.

Note that on the back plate there is a screw whose head tightens on the mold disk shield (often called the splash shield).

Line Delivery Rails Not the Same Height

Loomis: Once in a great while this happens. Test by laying a piece of brass rule, edge down, across the two. Unevenness will cause trouble when the mats go into the first elevator jaws. You can secure a little adjustment with paper shims under the rails themselves, and in extreme cases you can also loosen the bolt that holds the front plate on, then snug it back, and tap the front plate up or down with a rawhide hammer or a block of wood. Then tighten the bolt firmly.

Why Does the Line Delivery Rattle or Stop Half-way Into the First Elevator Jaws?

Harding: The most frequent cause is misalignment of the first elevator jaws.

This will be covered in the next chapter under *Adjusting the First Elevator Jaws.*

Front Jaw Adjusting Bar

If this has been turned end for end, you will have to stone a bevel on the right end. As manufactured, it is not reversible without this.

First Elevator Spring Powl Broken

This will stop a line so that it seems almost impossible to move it either way. If you finally get the line over, the next line will do the same thing.

Line Delivery Goes Over but Mochine Doesn't Start

This is usually maladjustment or malfunction of the automatic stopping mechanism, and in some cases improper adjustment or undue wear of the clutch. These are treated under *Starting and Stopping Adjustments,* page 250, and *Why Won't the Machine Start?* page 252.

Binding of the Delivery Slide Blocks

May be caused by improperly fitted new blocks which are loose enough in certain spots, are loose anywhere separately, but bind when together; also by twisted blocks, caused by the long or short finger jamming on return. These blocks are malleable and to a certain extent can be bent back into shape with a fairly large Crescent wrench.

Slowing Down Due to Swollen Toes

An occasional line may go over slowly. If there is a noticeable difference between this and other lines, you probably have a mat with a swollen or bent toe. Examine the toes on both sides as soon as the line gets onto the second elevator.

To Remove the Delivery Slide

HARDING: Four steps:

1. Push in the clutch lever and open the vise.

2. Send the line delivery over. At the back of the face plate, use a screwdriver under the delivery slide link spring, and separate the slide from the delivery lever.

3. Remove the delivery slide stop screw bracket from the left end of the face plate, and pull out the slide.

4. Notice the relative position of the parts. These can be very confusing when you start to replace them — particularly on an Intertype.

Squabbled Lines on Intertype

HARDING: There is a coiled spring around the right end of the adjusting rod where it enters a hole in the short finger. This spring, if broken, will allow lines to squabble. Keep the adjusting rod graphited.

Last Matrix Falls From End of Line in Elevator Jaws

HARDING: There may be a number of causes:

Long Finger Bent to the Left. Open the vise and straighten the finger with a monkey wrench or a Crescent wrench.

Misadjustment of Stopping Pawl. If this allows the machine to start up too soon, the line may not be inside the jaws. See *Starting and Stopping Adjustment,* page 250.

Worn or Broken Jaw Spring Pawls.

Badly Worn Back Jaw.

Right End of the Delivery Channel Rails Worn Down

HARDING: These wear in time — usually from a too-low position of the assembling elevator when the mats go over. They should be repaired or replaced.

Delivery Channel Aligning Piece

LOOMIS: This occurs on Linotypes only. (Sometimes too you find a Linotype with Intertype delivery rails.) This is a movable piece pivoted on a small shoulder screw. The screw head should not extend above the surface of the rail. The piece itself should move freely but not sloppily. When the long duplex rail on the assembling elevator is pushed in, the duplex rail finger on the left end lifts the aligning piece to permit mats to go into the delivery channel in the bold-face position. Otherwise raised mats are deflected to the light-face position. The tricky setting is in the finger. It is fastened with only one small screw, and is subject to movement from side to side. It should be set so that it firmly catches the offset in the aligning piece and lifts it, without binding, to its maximum height. On occasion it is necessary to bend the finger a little up or down. Tighten the screw firmly.

CHAPTER IX

FIRST ELEVATOR JAWS

THE FIRST ELEVATOR

Duplex Rail Levers

LOOMIS: On a Linotype, if the duplex rail levers are worn flat at the place where they hit on the blocks above, replace them. See that the springs have tension in any position. Observe whether the lugs on the duplex rail are flush with the surface of the front jaw. If they are standing out, it probably means dirt and gum. Usually they are a little sunken, which means you will have to put new stop pins in the duplex rail, for you will find the old ones flattened on one side.

Duplex Rail Is Too Loose

Take off the duplex rail cap underneath the front jaw. (Remember, the front jaw is the one toward you.) Also, it is easier to work on the duplex rail with the vise lowered to second position. Wash the cap, the duplex rail, and the surface of the jaw with gasoline, then rub with graphite. A toothbrush is good for washing; the fingertips are good for graphiting. Hold the duplex rail against a straight-edge and be sure it is straight in every direction. If bent, as it can be from a double-black lockup, it will give much trouble. Put it back and try it. It must work freely. But maybe it works too freely. See if it wiggles up and down. There should barely be perceptible motion. In the rare cases where excess motion occurs, a new rail should be gotten. If there is still slop, you will have to file off — but *carefully and squarely,* with the file held flat all the way across — the tops of the projections to let the cap down a little.

Duplex Rail Sticks

Suppose the rail sticks — which is far more likely. Loosen one of the cap screws and try again. If it isn't that one, tighten it and try another. It may be all. Take off the cap and use a prick punch to drive up little mounds of metal; use the punch sidewise. It won't require much. Try the rail again. If it doesn't work freely, test it again for straightness. If it is now loose, tap the little mounds with a small hammer and tighten up the cap again. You can use paper shims, but I prefer punching, though it smacks of butchery, because shims get lost and you have the job to do all over again.

Test the Jaws With a New Thick Mat

Now we have the cap on; the duplex rail is working smoothly and seats itself flush with the surface of the front jaw. Take a little-used thick pi mat and try it the full length of the jaws, in both upper and lower positions. If there are nicks, smooth them out cautiously with a file. Sometimes there is metal around the big screw heads which would interfere with the spacebands; clean it out.

First Elevator Jaw Adjusting Bar

How about the adjusting bar — the flat plate held by five screws through the front jaw? Does it have a groove on the top edge? You can reverse it if you hone a bevel on the other end, but I suggest a new one. Fewer complications. When you install the new one, try your mat both up and down. You may have to pin punch lightly the edge immediately below the bar to raise it a little to avoid binding the toes of mats in upper position — especially true if the duplex rail is battered.

HARDING: Do not reverse the adjusting bar. I have found a difference in the top and bottom edges.

Adjusting the Back Jaw

Now you find the two jaws are not parallel. They are wider at the right end. But wait! Wiggle the mat and decide whether the wideness comes only at the narrow part of the mat, where the projecting edge of the back jaw fits just under the mat's ear, or is it general and about the same across the ears also?

Let's assume it is only the thin rail, because that works out better for this explanation. Incidentally, try a straight-edge on the back side of the back jaw. If it is bent, run for a new one. Try the straight-edge along the thin rail. Here you usually find considerable wear on the right end. If this is only for a couple of picas, that won't matter, but inside the pawls it isn't good, because it allows the end mat to fall off or jump up and get smashed.

Let's say we're going to put on a new one. The procedure is the same as for an old one. Pull up the two screws. (On a Linotype, the shorter screw goes on the right.) Try your mat now. Try it first on the left end. Is it free? If it binds a little there, take off the jaw and use a prick punch both above and below the ridge on the separating block. Try it again. Get it right. Now for the right end. Is it loose? Lift the vise into the first position and let it fall back against your—er, shall we say guts? Supported thusly, you may now tap the end of the back jaw with a rawhide hammer, or with a plain hammer against a wooden block. It won't take much. Keep testing until you have it as close as it will go and not bind at all on the mat. It is well to note here that if those lugs are sunken on the front side of the front jaw and you didn't fix them as we

told you, the duplex rail will now protrude too far toward the back of the machine and confuse the issue very much indeed. (See above, *Duplex Rail Levers,* about putting in new stop pins.) Be sure the mat is not binding against the duplex rail.

Now suppose you get the back jaw in a teensy bit too far. Slide a round piece of wood, 5/8" or 3/4" in diameter, between the jaws, and pry out a little — *gently*. With a little care you can get a good adjustment this way, and if you don't soften up the jaw by too much bending, it will stay.

Is the Back Jaw at the Same Height as the Front Jaw?

A small square is the easiest way to tell. Otherwise use a piece of brass rule laid edgewise across the top of the front jaw. By holding it there, you can tell if the back jaw is high or just right. If high or low, take it off and peen the ridge on the separating block on one corner to bring it up or down (peen on the right end). It can be necessary to file off the opposite corner, but I do not like to get mixed up in this, for it is always hard to hold the back jaw in position once you have mangled the block. However, watch the right end, for it has to fit close to the line delivery rails. The two jaws must be level across the top and they must also be even at the ends.

This jaw business can be very tricky. When you get them so the mats travel free without binding and without sloppiness, with the jaws parallel, square on top, and even on the end, you get a bluebird.

First Elevator Jaw Spring Pawls

LOOMIS: I do not like these as stiff as they come from the factory. I grind out some from the middle so they have about half the original tension. Remember, the slotted one goes in the front jaw, and you have only to loosen the two screws and slide the pawl under the plate. An Intertype has a triangular piece pushed by a similar flat spring. The front jaw also has a small cylindrical piece as a filler. These triangular pieces get their corners worn and have to be rotated. The best way to get the one back in the front jaw is to lay the machine over on its back, but if that isn't feasible, use the stiffest cup grease you have and stick the triangular piece on the end of the cylindrical piece. It takes patience.

Tension of the spring pawls must be equal. Do not have one stronger than the other.

The Line Stop

The first elevator jaw line stop's importance will be recognized if it acts up. It should be square — that is, each side should be straight up and down, and the ends at the same level. Spread it about half an inch on the open end, and graphite with the fingers. If you have an automatic line stop pusher-backer, you won't need that much spread.

Adjustments of the First Elevator

HARDING and LOOMIS: These are not many.

1. The seating adjustment, made by the large screw closest to the front jaw. Run in a long line of caps and allow the mold to come forward. No spacebands. Stop the machine. You should be able to lift the elevator .010". On old machines we said 1/64" and sometimes took 1/16", but if our mats were not old already they soon would be. On newer machines, especially with quadder and two-letter display equipment, the .010" setting must not be exceeded. When you lift the elevator, you should be able to slide an .008" feeler under the screw, but not .012". Remember, *there must be some rise of the first elevator after it seats itself.*

2. The vise automatic. Use the smaller screw. When the elevator is fully seated, this screw should strike the top of the vise automatic rod just enough so the dog will clear the lip down below.

HARDING: On quadding and low-slug machines, the adjustment of the vise automatic must be made very closely.

The first rough adjustment of the vise automatic is made with the first elevator resting on the vise cap. Set the screw so the lip on the stop rod barely clears the lip on the dog. Then turn the screw down about one half turn and test with a two-point lead or brass rule under the seating screw (*not* on the stop rod). The machine should stop on two points — not on one.

3. Using the large bolt in the first elevator auxiliary lever just under the first elevator cam, adjust the jaws for height. The recommended height is about .005" below the corresponding tracks in the line delivery rails.

First Elevator Connecting Link

HARDING: These are practically the same on Linotype and Intertype, except that on Linotype the spring is at the bottom, while on Intertype it is at the top. Also, the measurements differ.

The plain eyebolt has a left-hand thread. The one with the spring has a right-hand thread. Prop the elevator up with a 40-pica piece of wood furniture under the head, and remove the link. Examine wingpin and small shaft. If they are worn they should be replaced. If the holes in the eyebolts are worn, they also should be replaced. On an old machine, it sometimes saves trouble with alignment to put in a new spring. The notched end of the barrel unscrews.

Now, with the link in your hands, adjust it. From the closest edge of the plain eyebolt to the edge of the barrel should be 3/4"; the measurement at the spring end is 13/16". This is for Linotype. For Intertype, make it 7/8" on the spring end, 5/8" on the plain end. Put the link back on and make the No. 3 adjustment described above. You can turn the barrel a couple of notches if

necessary to get a finer adjustment. Newer links have a lock nut to hold the dimensions given, but older ones do not. If you see that the spring is not functioning, dig out the corners of the notches a little with a three-cornered file, and the spring will hold the adjustment.

The first elevator auxiliary lever screw is the principal means of adjusting the elevator jaws with the line delivery rails. Do not use more than three notches on the link to supplement this adjustment.

The Gibs

LOOMIS: Not a complicated subject but a confusing one if you don't start right. On newer machines the right-hand gibs are doweled, and this simplifies the problem. On older machines you will have to start with them. The first elevator should move up and down perpendicular to the face plate, just missing the line delivery channel and the transfer channel. See that the line delivery rails are not extending past the channel castings to the left. Disconnect the first elevator link. Try the first elevator up and down, holding your knee against it to keep it against the right-hand gibs. I know of no simple way of measuring this. With the gib screws just snug, you tap the gib this way and that to get the elevator straight up and down (missing the channels by an equal distance), and with the proper clearance. Moving the lower gib will take care of the parallelism; the upper gib is largely the positioner. If the jaws miss the delivery channel too far, and you can't seem to bring it closer without canting the first elevator, use the delivery channel rails to close the gap. There is no such adjustment at transfer.

When this adjustment seems correct, tighten the screws firmly. Now take the upper left gib and bring it up snugly. Raise the elevator and allow it to fall slowly by its own weight. It should bind a little. With a linotype slug and hammer give the left gib one tap on the higher surface to drive it back a few thousandths of an inch. When the elevator is clear all the way up and down, tighten firmly.

The lower left gib is the easy one. Set it so the bottom of the first elevator has side play up to 1/16". This is necessary for alignment of the first elevator jaws with the molds – about which more later.

Run the machine a week. If the setting is satisfactory, I suggest you dowel the right-hand gibs. If you keep a little oil on the slides, you will not have to move those gibs again in your lifetime.

NOTE: Final clearance between the first elevator jaws (be sure they are even on the end) and delivery channel, also transfer channel, should be .005" or less. Too much at the delivery channel will cause trouble with mats going into the jaws; too much at transfer will make trouble with the ears of the spacebands.

Black-Face Flipper (First Elevator Filling Piece)

HARDING: The flipper is made primarily for use with head-letter molds, which, if properly equipped with safety stop, will cause a vise automatic stop if the flipper is not used.

Double-Black Squirts

LOOMIS: The other principal use of the flipper is on double-black squirts. No instructions are needed for this. We all get them occasionally. But old-time operators would not use the flipper for ordinary bold face, preferring to use the duplex rail in the assembling elevator.

Double-black squirts take time to clean up, and they also frequently ruin a lot of mats. We heartily recommend the Auxiliary Line Safety, which will protect you from carelessness. We do not find it so listed in The Book, but if you order it assembled and give the model of your machine, you likely will get all the parts. The Companies are very helpful in things like this.

Misalignment of Mats Caused by Lack of Parallelism of Front Jaw

QUESTION: We have been having trouble with matrix alignment, as you can see from the slug. I have put on a good many parts, with no improvement. — D. M. G., O'Brien, Fla.

HARDING: Your sample slug shows the first elevator jaws out of parallel with the mold. The mats at the right take all the alignment upthrust, while the letters at left are so low in relation to the mold that the tops of the capitals actually overhang the slug and are trimmed off.

It takes careful work to correct this. First, see that mold locking studs and stud blocks are in good shape; the disk should not rise with the upthrust of the justification block. (LOOMIS: Some correction may be secured for non-parallelism by adjusting the gib, but I prefer to use the gib for the delivery and transfer channels, and proceed with Harding on this subject.)

Turn the machine over with a line in the jaws, and watch two things: a visible rise of the first elevator in justifications (this latter insures relaxing of the mold disk if the disk is properly set. See *Mold Disk Lockup Test,* page 124.) These last items being correct, get two fairly thick pi mats that show no wear. Open the vise jaw to 30 picas. Put one pi mat at each end of the first elevator jaws. With the clutch, drop the first elevator and shut off the power just after the mold disk moves forward, before the pot advances.

Turn off the motor. Now with a large screwdriver pry up the first elevator head as far as it will come (about .010"). Be sure you don't bend the flipper rod. Try the two mats. They should both be tight against the aligning rail of the mold. The play in the lower gibs helps to secure this. But perhaps one mat is tight and the other loose. That is what produces your alignment difficulty.

To correct it, first try to loosen the two big screws that hold the front jaw to the first elevator without taking off the back jaw. Sometimes you can; sometimes you can't. Turn them back snug, not tight. Pry up again. If the unevenness prevails, take steps. Let's say the left end mat is tight. Use a rawhide mallet and tap down on the left end of the front jaw only — not the back jaw, or you will have all kinds of complications. Usually you can do it this way. If so, tighten the screws and test again. If not, you can take off the entire jaw and work on the front jaw key, a flat plate that controls this. By dressing off one corner and using a small sharp chisel to spread the opposite corner, you can get whatever you want — but *be very cautious,* and don't go into this unless necessary.

LOOMIS: This adjustment can be made separately, but if there is too much difficulty it may have to be preceded by *Setting the Mold Disk Guide Support Screw,* page 128. If the studs are badly worn, this may happen.

Trouble in Adjusting Height of First Elevator

QUESTION: I have had the connecting link off and set it according to The Book; I set the first elevator back at the auxiliary lever, and I used the link for finer adjusting, but I cannot get the jaws to line up with the delivery channel. — T. D. R., Bedford, Ind.

LOOMIS: First let us assume the delivery channel is set as narrow as can be and still give the mats freedom to move. Then the channel must be aligned with the jaws from front to back. Likewise vertically — and this may be your trouble. If either the line delivery rails are not the same height with each other, or the elevator jaws are not the same height, there will be trouble. Both should be squared, as outlined above in this chapter.

If your mats should show a slight mark at the left edge on the index side, near the bottom, your duplex rail is projecting. This also has been covered in this chapter.

A loose duplex rail cap, permitting the duplex rail to sag, will cause much trouble and frequent squabbled lines.

First Elevator Seats Jerkily

QUESTION: On our Model 14, No. 19114, the first elevator descends too hard into the vise jaws, and seats with a bang. We have new parts, and the slides are well lubricated. Can you suggest a remedy? — L. F. S., Holden, Utah.

HARDING in the *Graphic Arts Monthly:* One of the most common causes is the old style knife wiper. When it gets badly worn, it falls to the right and bumps the controlling lever bracket on the way up; this jars the first elevator. You will need a new Knife Wiper Lever and Bracket. The old ones can be bent into shape, but it takes some doing.

Also, the lugs on the duplex rail may project just enough to cause a bounce.

Sometimes the back jaw is sprung so that it hits on the jaw guard at the right end.

If the long finger has a flat, curved spring, see that the mats are not catching on the rivets.

Be sure the first elevator cam roll is turning.

From its lowest position, lift the first elevator up and down by hand, feeling for the obstruction.

What Makes the Clutch Crack When the First Elevator Goes Down?

LOOMIS: Anything that interferes just slightly with the seating of the first elevator. If the interference is more, the machine will be stopped by the vise automatic. First, be sure the vise automatic is set to stop on two points but not on one. Look for a screw worked out of the first elevator jaw duplex rail cap. Look for metal piled up under the first elevator lever.

Very often these last two causes stop the machine cold at casting position.

First Elevator Jumps After the Cast

QUESTION: The first elevator jumps upward out of the vise jaws instead of rising smoothly. Please tell me what to do. — S. Y., Wellington, Tex.

LOOMIS: This is a serious condition that needs correction at once. Your vise-closing apparatus is not functioning. Whether a screw or a tapered wedge, it should open up after the cast; otherwise the first elevator has to jerk out a line that is firmly wedged between the vise jaws. See *Letters Hang Over at End of Line,* page 120.

First Elevator Jiggles

QUESTION: The first elevator jiggles on coming down to normal position, sometimes enough to interfere with mats coming into the jaws. By pulling up the gibs I can help it some, but the minute I oil the slide it jiggles again. — A. N. D., Emporia, Kan.

HARDING: This can be mean. The first thing to check is the first elevator cam; both it and the roll should be smooth and true.

The first elevator slide must slide freely.

The arc of the first elevator cam on which the roll rests at normal position should be true and not cause any vertical movement of the first elevator; try it by hand.

Often there is a bind at the transfer position which holds up the first elevator momentarily and then lets it slip away so that the cam roll bounces on the cam. The natural elasticity of the cast iron first elevator lever will create a jiggle. This could result from over-strong duplex rail lever springs, from lack of grease on the levers where they contact the operating blocks, or from a bad setting of the first elevator "head" (first elevator slide guide, officially) which forces the front first elevator jaw against the intermediate bar.

This might also result from misalignment of the first elevator which allows it to rub hard against the transfer channel.

It also happens that a badly worn driving gear pinion can magnify other deficiencies and increase the jiggle.

Mats ot End Jump Out of Line in Recosting

QUESTION: On our Intertype, especially on recasting, a mat jumps out of the line just when the elevator nears the casting position. We've put in new parts but it has not helped. — C. A. C., Virginia City, Mont.

LOOMIS: See that the triangular detents present unworn corners to the mats. Equalize the springs. Sometimes they may need stiffening, but not usually.

First elevator jaws must not be sloppy.

On a 30-pica line, watch the transfer finger. It may push the end mat past the detent.

Delivery slide must deliver mats inside the detents.

Mot Jumps Up in Middle of the Line

QUESTION: I have been recasting a form, and at intervals a mat will jump up in the very middle of the line and try to get in the bold-face position. Either the mat gets chewed up or the machine squirts, or both. It beats me. — S. Y., Pawnee City, Neb.

LOOMIS: I think this results from a poorly fitted back jaw or a badly worn or sprung duplex rail, or both together. If it happens at the same place every time, you will find a scored place on the back jaw that will allow a mat to work part way up. There is some jolt to a recast, especially if it happens to be partly a bold-face line, but this will throw mats out of their proper grooves only if the back jaw is loose and inadequate.

Mold Cap Strikes First Elevator Jow ot Lockup

QUESTION: We have this difficulty when using 14-point liners only. Why is it? — A. A. M., Pattonville, Tex.

HARDING: This occurs only when 14-point liners are used in an ad figure mold, which has a thicker lip. The mold is marked "5-12 point," and means what it says.

First Elevator Cuts a Groove in the Face Plate

QUESTION: For a long time now our first elevator back jaw has been cutting a groove in the face plate, right across the delivery slide. Does this hurt anything? — M. O. T., Pendleton, Ore.

LOOMIS: Perhaps not now, but eventually it will. This is due to wear in the vise cap facing, a steel plate between the two upper first elevator gibs. This plate provides a sliding surface at this point, and since it is steel against cast iron, the steel wears first. I have tried shimming these but have enjoyed mostly trouble from it. If you have it ground smooth you can shim as much as .005", but it's cheaper in the long run to get a new one.

On machines with the open-type elevator you can see the middle screw of this plate when the elevator is at transfer. There is no such plate between the gibs at the bottom. Disconnect the first elevator link, take off both the left-hand gibs, and remove the first elevator. Install the new plate.

Unless there is unusual wear in the first elevator itself, this will do the work. I never have seen one that failed.

However, don't go away. You will now have to adjust the line delivery channel and probably the transfer (see *Adjusting the Line Delivery Channel,* page 100, and *Mats Spill Out at Transfer,* page 226.)

CHAPTER X

VISE AUTOMATIC

Tight Lines Don't Stop the Machine

QUESTION: We started getting the toes cut off of mats. Eventually we found the assembler slide was set too wide, permitting tight lines to go in. The mat did not allow the line to go all the way down. Why then didn't the machine stop? I thought it was supposed to. -- O.A.M., Modesto, Calif.

H. C. ROCKWELL in the *Graphic Arts Monthly*: Indeed it should. Let's take a good look at the vise automatic.

When the elevator is seated, it pushes down the vise automatic stop rod so the lip on the rod gets just below the lip on the stop dog. As told above in *Adjustments of the First Elevator,* page 107, the screw that operates the stop rod should be set so that the machine will stop with a two-point lead under the *other* screw, which would hold the elevator two points high (but will *not* stop on one point). When the elevator does not go all the way down, the mold disk comes forward and a mold strikes the dog and drives it through the vise. Its lip contacts the lip on the rod and pushes that toward the front of the machine. The bottom end of the rod throws out the clutch.

The spring breaks often in the dog. See that there is plenty of pressure to pull the dog back as soon as the mold disk retreats. Otherwise it will stay forward over the lip of the rod, and the next tight line will cast anyway.

Sometimes the slot in the top of the dog gets filled with metal and renders it inoperative. The lip may become worn and rounded on either dog or rod. They should be replaced.

LOOMIS: In replacing the dog, first screw the long screw down until the cross-pin in the end of the dog banks against the screw. Then, pressing on the dog, retract the screw until the dog barely slips under. Now the spring will be against the screw, and you will feel it. Hold the dog in and turn the screw on down firmly. This puts the screw between the spring and the pin, where it should be.

The clutch must be properly set, with clutch face and leathers clean so they turn loose freely.

On old machines the vise automatic may act too late, allowing the mold

disk to come forward and shear the toes of the mats before stopping. Note that the mold disk should stop so there is from 1/16" to 1/4" space between the mold and the vise jaws. From long usage the stop rod gets bowed outward, which requires the disk to travel farther before the machine is stopped. With care the stop rod can be straightened or even bowed a little the other way, by supporting its ends on stereotype castings and hammering in the middle.

HARDING: Occasionally the horizontal stop lever is bent. It can usually be straightened. It can also be bent with the point to the rear of the machine, to stop the machine sooner, Some machinists put an adjusting screw through the end to get the same result. This is a safer way.

The same effect can be achieved by welding material on the front end of the connecting bar – the long rod that runs to the vertical lever at the back of the machine; the horizontal lever works against the front end of this and sometimes wears it badly.

What Stops the Machine at Casting When There Is No Tight Line?

A mat in the vise, under the jaw.

A screw worked out of the duplex rail cap.

Metal piled up under the first elevator lever.

Obstruction by the knife wiper.

Why Does the Machine Stop at Transfer Point?

LOOMIS: This vise automatic was designed for two-mold machines. On four-mold machines there is a raised place inside the right edge of the first elevator, which operates an L-shaped lever that pulls the stop rod down when the machine ejects. The mold disk moves forward then, of course, and since the dog is operated by a mold, it would stop without the extra lever. It often happens that an m-o takes off the first elevator, then replaces it with the L-shaped lever out of position. This will cause a stop at transfer or ejection point. See that the lower arm of the L-shaped lever is on top of the pin protruding from the stop rod.

HARDING: This happens also on two-mold disks. In such a case, you will find the disk one fourth or three fourths out of time.

HARDING: When the small roller, D-531, that operates the L-shaped lever, is worn flat; on an Intertype, when the Vise Automatic Stop Rod Extension, U-759, is loose, or when the justification cam roll or cam is worn.

Full Lines Will Stop The Machine Although They Are Not Tight

QUESTION: My first elevator seems to be held up at the very bottom of its stroke – on full lines only. I get a vise automatic stop, but when I try the line

it goes easily into the vise jaws. Loose lines do not give this trouble. It seems the only solution is to set lines six points short. — W.F.A., Palmyra, N. J.

LOOMIS: This is caused by wear on the first justification cam and roll. The justification block stands too high, and when a line comes down, the bands are pushed up a little and spread the line. Get an oversize cam roll from Lino Parts. If you do not correct this, you will eventually ruin your mats.

Crushed Toes But Not From Tight Lines

HARDING: You can get sheared toes that look like tightline casualties if the back jaw is sprung too wide or if the thin rail of the back jaw is worn too much. A good test is to put a pi mat (we use pi mats so much because usually they are not worn) just inside the spring pawls. By lifting the bottom of the mat out and up, on a worn jaw, you can easily move the mat into the bold-face position. With a good jaw, you should *not* be able to do this without some binding on the duplex rail.

The Stop Rod Doesn't Rise High Enough

HARRY G. POTTLE in *Who's Who in the Composing Room:* Occasionally on very old machines the top of the stop rod doesn't come above the boss in the vise cap. Dress off the shoulder underneath enough so it will come through, where it can be engaged by the screw.

CHAPTER XI

THE PUMP STOP

Moking the Pump Stop Adjustment

QUESTION: How do you make the pump stop adjustment? It seems simple, but I have run into complications. — T.S.I., Portage La Prairie, Manitoba.

HARDING: This may be because you did not make the adjustment in the right position. With machine at normal, push in the clutch and go around to the side. Reach under the first elevator jaws and push the right-hand vise jaw hard to the right. Now the pump stop lever should clear the block by about 1/32". This is the way it will be at casting position. Set the adjustment screw; then check again, and finally cast a line in the machine and watch.

Setting the Intertype Pump Stop

The Intertype stop operates on an entirely different principle. Here the pump stop lever is toward the front under the block always except when a loose line goes in. It is operated by the first justification lever. To set it, pull the plunger pin and turn the machine over without a line in the jaws. When the justification levers reach full height on second justification, the pump stop lever should go forward to within 1/32" of the pin.

Pump Stop Is Set Properly but Foils to Operote

QUESTION: My pump stop fails to operate. The lever binds against the block and will not slip under it as it should, so every line casts — tight or loose. What should I do? — T.R.T., Wessington Springs, S. D.

LOOMIS: This is from wear in the pot pump cam and cam roll, which lowers the pot pump lever itself. The stop lever bracket is to some extent adjustable, and should be set so that the stop lever just comes under the stopping block without binding. Note that the lever generally has some slop in it, so turn the machine over a few times and observe if it lies flat as it returns to position under the block. Otherwise it might rise up and hit the block and fail to go under.

Check the pot pump lever cam roll. If dry, it may be dragging on and wearing the cam. Keep a thin film of oil on the cam surface itself. I know The Book says this is bad, but it is not so if the cam roll is in good shape and is lubricated

so it turns freely. *Interesting note:* In late years certain machines have come equipped with a felt wiper to lubricate this cam. Oil keeps the cast iron of the cam from wearing away – and this can happen especially fast after the first 1/16″ or so is gone.

When it does wear down, one can buy a "banded" cam, but if the cam is not too far gone (down to the spokes, you might say), buy an oversize cam roll from Lino Parts, and remember to oil the cam. *Always,* in installing a new cam roll, get a new pin to go with it. A new cam roll will almost never turn properly on a worn pin.

HARDING: You can, with a rat-tail file, elongate the bolt holes in the pump stop lever bracket, so it can be lowered. *But watch:* if you let the pump lever rest too low, the plunger will cover or partially cover the holes in the side of the well, and you will not get a good slug. An oversize cam roll is called for.

Too Much Clearance Between Pump Stop Lever and Block

HARDING: See that there is never more than 1/16″ clearance between the lower face of the block and the upper face of the pump stop lever. If there is, the pump may descend far enough on a short line to expel a little metal; then the next line may bring a back squirt. 1/32″ is better here.

Pump Stop Lever Is Clear of the Block but Does Not Return

LOOMIS: Occasionally an old cam roll is so badly worn that a new roll only – not oversize – is needed. Take the cam roll to the garage and have it miked. A new roll (not oversize) measures 2.000″. One half of the wear, roughly, will be increased 50% at the pump stop lever. In other words, if the old roll measures 1.970″ (rather unusual but not phenomenal situation), the difference at the block will be about .022″, almost two points.

Pump Stop Should Have Compushency

The pump stop, when you push over the end with your thumb (to the right), should have definite pressure. The steel wire spring on the pump stop lever sometimes is out of its groove, encased in linotype metal, or broken. See that it is operating, and oil both the screw on which the lever is hinged and the bolt on which the long operating lever is hinged.

Auxiliary Pump Stop Spring Not Needed

LOOMIS. Some operators, aware of a deficiency in the spring but not knowing how to remedy it, have installed an auxiliary spring. This is usually much too strong, and when it is, it damages mats, causes the end mat to fall off, and perhaps other troubles. It is not necessary when the proper spring is working.

CHAPTER XII

THE VISE AND VISE JAWS
JUSTIFICATION AND VISE-CLOSING
VISE LOCKING SCREWS

How to Lower the Vise to Second Position

QUESTION: I lowered the vise to the second position and broke one of the eyebolts in the first elevator link. Our machine is a high-base Model 5. How do you explain this? — A.P.O., Washington, Pa.

HARDING: I think I can explain this. You lowered the vise to the second position without first dropping the elevator. This might happen on any machine, but especially on the high-base models.

Proper procedure: Let the elevator drop to the vise cap. Push in the clutch. Pull out the wing pin in the end of the vise-closing lever (at left side) and disengage the wedge or rod that runs up to the left-hand vise jaw. Disconnect the first elevator lever link. Take off the galley, either upright or inclined. Lower the vise to the first position. Holding the vise up slightly, reach down and pull out the stop pin at the lower right, and ease the vise down to the second position, at the same time pulling the first elevator up to avoid getting the first elevator lever caught in the crotch at the bottom.

Some later machines have the stop at the bottom arranged so you can work it with your foot.

LOOMIS: Caution: In raising the vise back to the first position, lift up the justification block so the first justification lever will go *under* the collar. At the Mergenthaler School in New Orleans, I once saw a budding m-o fail to do this. The first elevator lever broke off clean. Professor Churchill was highly disgusted, and said so. He sent the lever out to be welded. The b. m. o. installed the welded lever and turned on the machine. Sad to relate, he had again neglected this precaution, and the first elevator lever broke again — in a new place. It was a testimonial to the welding job — but Professor Churchill was, for once, completely speechless. It is not difficult to understand why.

Vise Sometimes Goes to Second Position Without Being Expected to

LOOMIS: On any machine there is a spring that holds the stop firmly against

the frame for the vise to rest on. If this spring becomes broken, or if the stop itself gets gummed up or corroded, it may not come all the way back, and when you turn loose of the vise, expecting it to come to rest, it falls on down, scaring you out of a day's growth and perhaps breaking or bending parts. Clean up, oil, and replace the spring. The knob screws off for removal of the stop.

What Keeps Bending the Vise Closing Wedge?

LOOMIS: Usually this comes from lowering the vise to second position without disconnecting the wedge.

Letters Hang Over at End of Line

QUESTION: On the enclosed slug you will note that the letters overhang on the right end. This happened once on the left end, and a traveling machinist fixed it, but I don't know how.—T.C.W., Brantford, Ontario.

HARDING: This is simple. (The left end may not be as easy.) The right-hand vise jaw banks against an adjusting screw which you can see as you sit in the chair, just under the line delivery channel plates. Turn this screw in until a capital O shows a tiny (.005" recommended) shelf at the end of the slug. However, if you use butted slugs, you'd better let the O come flush with the end.

Be sure to set the pump stop after making this one.

To adjust the left-hand vise jaw:

On an Intertype, the left-hand vise jaw is adjusted by a similar screw — except on quadders, where you have a knurled knob to turn.

On a Linotype, there is first the old style, that operates as a screw; the new style, that operates as a wedge; and there is the Intertype, that operates as a screw.

Oddly enough, the old style is not shown in Mergenthaler catalogs dated as far back as 1913, but appears in the catalog for Models 1-5, K, and L, dated 1934. This type has a pear-shaped lever with three holes in it, which fits against a collar with several holes. The adjustment is secured by fastening the two together in different combinations of hole, the inside piece being a threaded piece. The holes in one are not the same distance apart as those in the other, so very fine adjustment can be secured.

On the later style Linotype, loosen the set screw in the split bearing at the left end of the vise and turn the knurled knob in for shorter lengths, out for longer. Tighten carefully.

On quadder Intertypes, loosen the thumb screw at the left end, and turn the knurled knob clockwise to bring the jaw to the left. Tighten the thumb screw and set the zero marks to correspond.

If you have a screw and lock nut in the lower end of the wedge (the long piece sometimes called the vise closing lever link), adjust this screw to pull the wedge all the way down, but not far enough so the jaw starts moving back to the right.

On an Intertype, play may develop between the Vise Closing Block (U-217) and the Vise Closing Screw (U-640). Loosen the set screw at the left end of the vise closing bracket and turn the octagon-head bushing screw. Adjust until the vise closing lever link can be raised to its full upstroke without interference, allowing only enough play between the screw and the block for free movement. Hold the screw to the left and tighten the set screw.

Vise Jows Should Not Accumulote Metal

Loomis: The vise jaws should not be allowed to accumulate metal, especially on the inside surface at casting point. Keep this scraped off; polish with mold polish, or, better, with graphite and oil. Simoniz wax helps to prevent the metal from sticking. Metal at the casting point will crush the side walls of mats and create hairlines.

On vise jaws in long use the face presented to the mats (the inside end) is usually worn down along each edge and high in the middle. Get new ones — they are not hard to install — or trade for a pair that has been ground. The new ones will have a relief in the middle, which is good.

Justificotion Springs Need Oiling

Loomis: There is not much maintenance on the justification levers and springs, but that little, as usual, is important. The cam rolls should be round and free from flats. They are easily replaced.

Turn over the machine until the *first justification* lever goes up. Back the machine just a trifle. Now you can reach the wing pin screw. Loosen it and have somebody (or do it yourself if you're dextrous) insert a bar over the lever and under the base of the column of the machine, and pry down on the lever so you can remove the cam roll. Replace both cam roll and pin. Poke out the oil holes or grooves.

For the *vise closing* lever, the screw is on the inside. Turn the machine until just before the first justification lever goes up for the second time, just before the cast. This probably will have to be done by hand and whoever works the clutch should also hold it, to prevent accidents, until you are through. You can now loosen the screw from the inside. Now, if the wingpin in the vise closing cam roll is opposite the deepest part of the first justification cam, you can pull out the pin, perhaps loosening it with a screwdriver blade under the wing. Clean the holes or grooves and put in new parts while somebody else holds down the vise closing lever at the end. Needless to say, the machine is locked up, so don't tarry. Get it unlocked as soon as practicable.

Now we come to the oiling of the springs. At the top of each spring rod, in the justification levers, is an oil hole. This usually is thoroughly clogged. Let's remove the springs. Turn the rod (that goes up through the center of the spring) with a pair of pliers until the hole lines up with the notch just below the collar at the bottom. This is a good job to do when you are tired, because you will have to lie down to see the hole. Sometimes you have to let the justification levers go up and then have somebody push them down to locate the holes. Insert heavy nails in the holes. There is also a fork you can buy to push down on the springs, or you can have one made by welding together a couple of pieces of ½" round steel about two feet long, and spreading one end in a U shape to fit around the nut.

Now, at the point in the cam where the lever rises highest, raise the lever and lift out the spring. You may find the top of the rod worn to a point. Grind it round and smooth. Clean out the oil hole carefully with a nail. Oil the top of the rod (not grease, because that will plug it up again), and replace with someone lifting the lever. Oil occasionally after this.

Rust and a pointed shape will sometimes cause some odd troubles with justification.

Incidentally, did you notice those springs were different? The one made of the heaviest wire is the first justification spring and goes nearest the keyboard.

Why Do Lines Vary in Length on Left End?

QUESTION: We have had this trouble for a long time. My theory is that the justification springs are not strong enough. — P.N.W., Windsor, Conn.

LOOMIS: That isn't it. If it were, you'd get squirts on the left end. Presumably the variance is not more than a point or so. This indicates a malfunction of the equipment contained in the Vise Jaw Wedge Bracket, Assembled.

First, see that the knurled adjusting bushing is tight.

Lift out the adjusting rod locking pin that you use to change the length of line. Hold onto the block and withdraw the long adjusting rod after taking out the screw at the left end to disconnect the rod from the adjusting bars (the long flat pieces that run across the top of the vise cap). Hold onto the square wedge block, for there are a spring and a plunger in it. If there is not such spring and plunger, this can be the cause of variation in line length. If there is, and you don't hold it, you may find it out in the back yard.

If the wedge block is deeply scored, it should be ground smooth on a fine wheel — preferably replaced.

In particular there is one piece, the Wedge Guide, a round brass part, that may get grooves in it from the adjusting rod and make changes on the left end of the line very difficult. This wears rather fast.

See that the two felt wipers are held against the wedge, and oil them when you oil the machine.

Why Do Vise Locking Screws Break?

QUESTION: We have a Model C Intertype, No. 5519. The trouble is it breaks off the vise locking screws whenever you use the head-letter mold without the flipper. — I.A.C., Belle Fourche, S. D.

HARDING: It should. Older machines are not equipped with automatic mold slide safety devices.

This can also be caused by a double-blackface line. Sometimes the pot lever breaks instead.

LOOMIS: Sometimes one locking screw has a habit of working loose; then the other may break off under the strain of casting. There are only a few points to watch in connection with vise locking screws:

The lug on the end of the screw should be in fairly good shape, not chewed up and not half broken off.

Keep a little hard oil in the vise locking studs. See that they are tight. A long screwdriver or a ¾″ socket with a long extension and a universal joint will tighten the right-hand one from the rear.

See that the two screws pull up evenly. Tighten one, then tighten the other and watch to see if the vise moves in. Reverse the process. The one that pulls in needs fixing. Use the shims (Vise Locking Stud Washer, E-392; get about three each of .002″, .005″ and .010″) from the Company. Shim until both screws come up evenly.

Observe carefully whether or not either screw (especially the right hand one) pulls the vise to one side as it is locked up. This indicates a badly worn screw; get a new one. If this doesn't do the job, you have also a worn stud, and that too should be replaced. This will cause erratic trim.

Mold Cam Roll

CHAPTER XIII

THE MOLD DISK AND SLIDE

Movement of the Mold Disk

HARRY G. POTTLE in *Who's Who in the Composing Room:* An experienced machinist usually takes a quick look at the movement first. The mold disk comes up to the jaws. The pot also advances but does not move the disk. The pot recedes. The disk recedes — not much but visibly. (On an old machine it may be invisible). Then the disk advances to its previous position and the pot comes up and pushes it hard against the jaws.

To Adjust the Mold Disk Lockup

QUESTION: I hear operators speak of lockup tests, and it seems to me this is confused. Some are speaking of mouthpiece lockup, others of mold disk lockup. Are they the same, or are they different? — T.M.O., Sioux Falls, S. D.

LOOMIS: They are different, though they work in almost identical areas. The *mouthpiece lockup test* is described in *Test the Pot Lockup,* page 177.

This is the *mold disk lockup* test:

First, secure from your garage a piece of round steel 5″ to 6″ long and .6875″ in diameter (11/16″), plus or minus .001″. 11/16″ is the thickness of the front jaw, which normally acts as a backing piece for the vise jaw. You can afford to go to some trouble to obtain this piece of the proper diameter, for it will be used again in a moment. Its use simplifies the test, and since it will be needed every year or so, tag it and put it away where it won't be grabbed up when somebody can't find the mallet. With this rod, you can make an accurate test without removing the back jaw. But first, check for play in the mold slide, as follows:

Drop the first elevator to the vise cap and stop the machine with the mold disk forward. Lay a matrix on the first elevator jaws with its bottom against the disk. (This is Sterling Hoff's test, and a good one.) Pull the mold disk as far forward as it will come; then push it back. (Leave the mold cam lever handle up, of course. This is to check the play in the slide.) Now the gap between the mat and the disk should not be over .010″, preferably much less. Sometimes it will be 1/32″ or 1/16″, and you had better take steps before making the lockup adjustment. See *Too Much Forward and Back Play in the Mold Slide,* immediately following.

Take a piece of furniture about 8″ long and put it on the vise cap and under the first elevator, thus holding up the first elevator. Pull the plunger pin; close the left-hand vise jaw; put the test rod in place behind the jaw. With your finger on the vise automatic stop rod, have somebody turn the machine forward by hand until the mold cam roll is at the highest point on the second shoe in the mold cam track.

Now if your disk is one of those that has excessive play, you are in a dilemma, for the thing has to be adjusted whether it's worn out or not. My own method is to adjust it with the disk in its farthest back position all the time. Therefore I always push the disk firmly backward before making the check.

Now, with the first elevator up out of the way, the test rod behind the left-hand vise jaw, which is closed, the disk pushed back as far as it will go, and the mold cam roll at the highest point on the second shoe just before the pot goes forward (I repeat myself here, because all these conditions must be rigidly observed), there should be .005″ between the mold and the jaw. This is about two thicknesses of newsprint, but a steel feeler gauge is better. With the disk pushed back (I'm getting to be annoying about this, but you must watch it), a .005″ feeler or two pieces of newsprint should drag when pulled between the mold and the vise, but they should move.

This is adjusted by the eccentric in the lower end of the mold slide lever at the back of the machine. Pull back on the little handle to move the mold disk forward; push forward to bring the mold disk back (and always, when bringing the disk backward, push it back before testing). This can be a tricky adjustment, but, once made, hang onto the little lever and tighten the lock nut securely, and it will stay for quite a while. On some machines the stud has been turned upside down and the movement of the adjusting handle is reversed.

Wait a minute! Don't wash up yet. How about the face-to-face parallelism of the vise jaw and the mold? Hadn't thought of that, had you? If you've already used shims under the vise locking studs to bring the vise up evenly, you shouldn't have to bother with this — but sometimes you do. It is no good to have .002″ clearance on one end and .010″ on the other. Try your feeler all the way across. If there is a difference, find out how much it is, and use shims under the vise locking studs to even it up.

The Mergenthaler Company emphasizes that this adjustment must be made on the high point of the second or smaller shoe. This is correct. They recommend from .003″ to .005″ between mold and vise jaw. This is correct for newer machines. On old-timers, of course, you will have trouble getting that close. I generally am satisfied with .005″ to .010″.

HARDING: In tightening the lock nut, slip a 6″ piece of ¼″ pipe over the adjusting lever to hold it without movement. Otherwise sometimes it is very difficult to keep the pin from turning.

Too Much Forward-and-Back Play in the Mold Slide

LOOMIS: We'd better take this up while we are near it. This sloppy movement is caused primarily by three parts: the mold cam roll (the one that runs in the track, which wears both in the bore and on the periphery); the mold cam roll eccentric pin, which wears out of round; and the mold cam lever roll (with the larger hole, which wears; this roll itself doesn't usually wear much on the outside). On occasion, on very old machines, the two small mold cam shoes in the track will wear, but not often. In replacing these, I have generally found that I have had to grind them down to the thickness of the old ones to allow a new cam roll free passage. The cam roll *must* go through freely all the way around, especially over the shoes. You may use a feeler gauge between the roll and a shoe, and think you have .005″ play, but unless it is more than this, you'd probably better leave the shoes alone.

I prefer the eccentric pin not to measure less than .498″ at any spot, and both cam rolls should not be below 1.497″ at any spot.

Removing the Mold Com Shoes

In case you do have to remove a shoe, it is worth approximately one million dollars Chinese to know how to do it without removing the main cams from the machine. First, by poking with a long screwdriver, and using a small hammer on a screwdriver to butcher the screws, and various subterfuges from there on to remove the screws, you are in a position to operate. Now use an old liner and drill a hole in it big enough to pass a 10x32 screw (a No. 20 drill or larger). Lay this liner across the track in the mold cam. Now put a 10x32 screw, ½″ long or more, through the hole, and turn it into the threads in the shoe to a depth of three or four threads. Get a couple of pieces of wood furniture, and a handful of 6-point slugs, and put them under each end of the liner, building it out far enough so the shoe can come off the pins. Turn the screw into the shoe. The shoe will come off.

The first mold cam shoe on a Linotype, the one with a rise in it, measures about .395″ new. These often have to be ground down for a new cam roll. I cannot give you the thickness of the second shoe, although as I remember it is the same. I have replaced a number on principle, but do not do so any more. I would say it is practically never necessary. Just check it to see that the rise is there; that's all unless your machine is very old.

Note that on rare occasions the large diameter stud at the bottom of the mold cam lever wears considerably out of round. This is a part of the casting, and the entire lever must be replaced. Be sure the washer and screw are present to hold it on.

Final Setting

Now, having replaced both rolls and the eccentric pin, and shoes if necessary, set the forward thrust of the mold slide as given above in *To Adjust the Mold Disk Lockup.*

To Remove the Mold Cam Lever

LOOMIS: This can be done by taking out the ejector link, pulling down the mold cam handle and pushing out the shaft with a screwdriver through the hole on the far side, after which the lever can be removed from the bottom.

Can a Warped Mold Disk Be Used?

LOOMIS: Yes – and probably seventy thousand of them are, for very few cast iron disks that have been in use for any length of time, escape warping. The *amount* of warp is what counts. On two-mold disks it usually can be handled by shimming the molds. (See *Shimming the Molds,* page 214.)

On a four-mold disk it is difficult to use a disk that is warped more than .005″ out of true. Check this by setting the mold disk guide just to kiss the disk at its highest spot, then turn to the lowest spot and use a feeler. A dial indicator is a wonderful instrument but not available to most m-o's.

How About a Rebuilt Disk?

QUESTION: My disk is badly warped, and I have been advised to have it rebuilt. They say it is considerably cheaper. – D.I.U., Bucyrus, Ohio.

LOOMIS: To give proper credit, I think disk rebuilding was perfected by Montgomery & Bacon about twenty years ago. They cut off the outer rim and installed a steel rim, pinning it in place, then shaving the disk on both sides to secure perfect straightness. Others do it now, and when properly done it is a good job. It does not save as much money now as it did, but to my notion it is a better disk because it is steel, and steel apparently does not warp. I have installed many of these and had excellent luck with them. Some ten or twelve years ago Intertype began using steel for their six-mold disk, and I have been told that Mergenthaler is using steel disks.

To keep the record straight, Ottmar Mergenthaler invented the Linotype, and there must go the major credit. The Intertype Corporation has provided competition and refinements – and competition is necessary. They too deserve much credit. Smaller places – Montgomery & Bacon, Rich & McLean, Star Parts, Lino Parts, and others, also have contributed, and deserve credit in a smaller degree. Not all of their parts are good, but some are excellent – such as the rebuilt disk. It is worth noticing that some smaller companies that started precariously have grown large and substantial; some have been absorbed into the two big companies; others make products that now are sold directly by the big companies. Witness the Mohr saw and the Monomelt and the Margach feeder.

Adjusting the Mold Slide Gib

LOOMIS: On very old machines there are two adjusting screws below a plate that forms the left side of the mold slide groove or slide. There should be about .006″ play (¼ turn of the screws). Turn them in, then back off. Just enough to provide free movement is necessary.

Loose Mold Screws Cause Trouble and Squirts

QUESTION: There seems absolutely no reason for this, but about every fourth line I get a loose-line squirt. I have tried these lines over, and they are not loose. The foreman accuses me of sending in loose lines, but I have repeatedly tried these lines over and they are not loose. Sometimes I have noticed that some spacebands do not come up as far as others, but I don't know why. — M.I.M., Odessa, Del.

LOOMIS: Provided the forward thrust of your mold slide is properly set, some other obstacle is impeding spread of the lines at justification. It sounds to me as if a mold screw has worked out. On an Intertype this can be caused by leaving the border block recasting pin in the justification rod.

Setting the Mold Disk Guide Support Screw

LOOMIS: Some machinists adjust this after the disk comes forward onto the locking studs, by turning up the screw with the fingers, and locking. This is correct for old machines, but if you are installing new locking stud blocks you will want to go further.

On Linotypes the prime setting is made as follows: with the disk in normal position, loosen the screw. Back the machine. You will need a light. Insert a .002″ feeler strip between the top sliding surface of the slide and the corresponding surface on the column of the machine (vertical surfaces just behind the knife block). Now, working the strip slowly back and forth, turn up the screw until the feeler binds. Tighten the lock nut carefully and check again with the feeler.

On an Intertype this .002″ is prescribed at the bottom instead of the top.

What Makes the Mold Disk Pound?

QUESTION: My mold disk pounds very hard sometimes, until it seems as if the machine would break. How can this be fixed? — P.B.T., Kingsport, Tenn.

HARDING and LOOMIS: Some disks pound as they come forward at casting point, some at ejection point, and some at both.

If both, or if at casting only, look for:

Dry locking studs (these should be oiled); anything that binds the disk, such as metal under the back knife, back knife set too tight, dry mold disk stud, mold

disk guide too tight, metal on back of mold, metal gathered around the Ejector Blade Guide, Assembled (old style ejector).

One way of getting at the answer to this trouble is to watch the disk as it advances onto the studs. Does it advance straight, or does it jerk a little forward or back?

If back, adjusting the brake tension may correct it, particularly if the disk has to *snap* back. This also can be: headless screw in rear end of bevel gear shaft loose; gear segment or shoe on the mold turning cam loose; oil on the brake leathers.

If it snaps ahead, look for metal behind the disk or other retarding agents previously mentioned.

This sort of pound can be caused also by misadjustment of the mold disk guide support screw or the long gib under the mold disk slide on old machines.

If it pounds only at ejection, look for misadjustment of the mold-turning cam shoe at the back, or a loose gear segment.

Be sure the disk is tight on its stud.

An odd sound, more like a dull click, coming while the disk is turning, indicates metal in the teeth.

A mold cap liner screw, worked out, also can cause this.

For pounding of slugs as they are ejected, see *Why Do Slugs Pound at Ejection?* page 209.

What Makes the Mold Disk Turn Hard?

HARDING: Nine times out of ten, metal lodged somewhere behind the disk, under the back knife, around the ejector guide. Back knife set up tight.

How to Adjust the Intertype Mold Cam Safety Lever

HARDING: This is located under the rear end of the mold disk slide. When the forward thrust of the mold disk slide is interrupted, the clutch is thrown out.

To adjust it, shut off the power, back the cams a little, pull out the clutch lever. Turn the adjusting screw seen above the drive shaft until there is approximately .010″ clearance between the screw and the lever. Tighten the lock nut.

To Remove the Mold Slide

HARDING: Lower the vise to second position as instructed in *How to Lower the Vise to Second Position,* page 119.

Remove the wing pin from the ejector lever link at back and remove the link.

Lower the mold slide lever handle.

Pull the slide out a little.

(But if a universal ejector, set the ejector at 12 picas before you pull out the slide. With a long screwdriver unscrew the long rod whose head is toward the front. The ejector blade controller slides along this rod. Now the controller, if worked at, will drop out. Disconnect water tubes, if any, from the stud.)

Grasp the mold slide under the mold disk guide support at the left. Use a rag, for it may be hot and oily. Grasp it about 6 inches back from the disk on the right, with your hand protected by a rag, under the slide.

Lift it out and take it away.

To Remove the Mold Disk

Old Style Linotype: Lower the vise to second position but do not remove the slide.

Remove the guide with a ¾" socket wrench.

Mark disk and stud to insure returning them in same relative position.

The nut at the front may be right-hand or left-hand. Left-hand usually are marked "L H" on the end of the stud, but not always. If you do not have a big enough socket, use a punch and try it both ways.

Water-cooled disk:

HARDING: Lower the vise to second position but do not remove the slide. With a ¾" socket wrench take off the guides. With a big screwdriver take out the screws that hold the plate on front, and pull off disk. In replacing, put the oil hole of the plate at the top.

Snug up the bolts that hold the guides, with the guides touching the front side of the disk, and gently tap the guides back until they barely miss the disk, turning the disk all the time.

Milton Anderson brings the top guide up to the front of the disk, the lower one up to the back side.

Intertype disk: Lower vise to second position.

Remove the one or two guides.

A thin flat wrench is provided to fit the rear nut. Pull the disk out part way and fit the wrench over the rear nut. *Do not ever loosen or remove the front nut.* The rear nut has left-hand threads, so turn the disk until the handle of the wrench bounces against the mold slide on top. Bounce it until the nut loosens. Tighten it the opposite way.

To Time the Mold Disk

QUESTION: I would very much appreciate it if you would explain to me how to time the mold disk when it has been pulled out after the cast. — E.S.Y., Shelby, Mont.

HARDING: Pull out the pinion and turn the timing mark mark to 3 o'clock. Slide the disk back so one of its timing marks will coincide. Now, do you remember which mold was where when you pulled out the disk? If it's after the cast, it may be confusing.

LOOMIS: Take off the mold disk turning pinion. Back the machine to ejecting position with a mold on the locking studs, ready to eject. Replace the mold disk turning pinion so it is seated on its own positioning pin. Turn the machine forward and you should have it.

Failure of the Mold Disk to Turn

See *Mold Turning Mechanism* in Chapter XV.

CHAPTER XIV

MOLDS

MOLD LOCKING STUDS AND BLOCKS

MOLD BANKING BLOCKS

Types of Mold

HARDING and LOOMIS: There are three principal types of mold: universal, ad figure or advertising, and recess.

Universal: Cast solid slugs from 5-point to 14-point. Upper lips are thin. Watch the markings. Some will not clear the jaw on 14-point.

These molds are made with .0025" taper from top to bottom of the body of the slug, and taper also in the ribs, for easy ejection.

Advertising: Primarily to cast two-line figures. The ribs are wider and have no taper – that is, the slug, without trimming, is almost the same thickness from top to bottom. This makes it harder to eject, but these slugs, if untrimmed, will not bulge like universal slugs.

These usually are marked "5-12-point," and the lip is .028" thicker than universals. 14-point liners in these molds will damage the first elevator jaw.

Advertising figures larger than 18-point require a special mold. Ask your salesman.

Recess: Some cast as low as 10-point. It depends on the ribs. Some, to cast 24-point, have only 6 points space for the ejecter blade.

Linotypes require special liners for the left end. Intertypes use standard liners, but you must add the depth of the recess to the liner point size. Intertype recess caps can be moved horizontally to produce a rib at the left end of the slug. Newer Intertype recess molds have a "shelf" that fits in a hole in a regular liner. Intertype right-hand liners may be used in the left end to cast 30 picas.

Linotype old style recess molds have only nine ribs and cast a fairly thin lip on the slug. Newer molds have up to fifteen ribs and cast a thicker lip on the slug; therefore the left-hand liners are different on these two types.

What is the Proper Way to Cleon Molds?

HARDING *and* LOOMIS: Wipe them daily with a rag in front, and scrape with a piece of brass rule. There should be no metal on the back. See *What Do You Use on Mold Wipers?* page 142.

Mold polish definitely abrades a mold. Do not use it unless necessary. A mixture of graphite and oil will do most jobs. Graphite and castor oil is good, but castor oil leaves a gum. Use a piece of 6-point reglet to rub the inner surfaces of the mold with graphite and lubricating oil. Some molds never need this. Some need it fairly often — once a week, say. Some recess molds need it especially. On these you will have to use a match or similar instrument to rub the recesses. In rubbing, keep it up until you feel the roughness go away, and the stick slides over the steel. It doesn't take too long.

But don't polish the molds at all unless you have trouble with ejection. It has been found that the apparently rough coating of gray oxide on a mold actually helps ejection.

How Often Do You Take Off o Mold for Cleoning?

QUESTION: I have been taking the molds off the machine for cleaning once a month. The foreman says I should do it every week. What is the correct procedure? — I.L.S., Monongahela, Pa.

LOOMIS: This is the question I have been waiting for. *Do not take off the molds for any purpose whatsoever except repair.* They can be cleaned on the machine. Squirts can be cleaned up without removing a mold. You get a mold on the machine and get the knives set to it and it will run for years, but if you constantly take off and put on the molds you probably will constantly be fiddling with the knives. This more particularly applies to molds that are shimmed. *Leave those molds where they are!*

How to Remove o Mold for Repoir

Loosen the liner screws, then take out the four screws *in line* on the front of the mold. With a rag, hold onto the mold as you take out the last screw.

Do not loosen the other two screws. They hold the mold keeper plate. If you do loosen them by error, push the plate up to the top and tighten the screws. If your lines do not come at the right place on the slug, send the mold to the factory.

While the mold is off, lay a straight-edge across the cap and body when they are together, to determine if the cap is aligned with the body of the mold.

How to Tell if o Mold Is Warped

LOOMIS: I am very dubious that an untrained man can with a straight-edge determine if a mold is warped unless it is very bad — say .003" to .005". I have had machine shop training and considerable machine shop experience during the war, and I doubt that even a trained man can determine .0015" of warp, which is the most I have ever seen in a report from the Company. This is not done with a straight-edge, but most likely with a dial indicator — and those can be tricky where that small dimension is involved. Since working in a machine shop, I have quit taking the responsibility for this decision.

As for warping, it is invariably the cap that is warped. However, either cap or body may be *worn down* considerably on the short end (front to back). This can be measured with a micrometer. Anything less than .873" may be considered defective. I have seen them down to .856" in spots — a path worn by repeated applications of mold polish to the back wiper.

Straightening the Mold Posts

HARDING: There are three ways:

1. Send the mold in to the Company.

2. Put the mold and cap into a vise, with brass to protect it from the jaws, and an extra 2 points behind the body and in front of the cap, or vice versa, and squeeze into alignment.

3. Take out the posts and hammer them straight. This is difficult, for they are held by tiny pins. Also, they are fairly hard and may break, as they may in the vise treatment. With a broken post, you can use the mold, but you'd better get a new post as fast as possible.

To Remove an Intertype Mold

HARDING: Remove cap and liners, then the four screws.

How to Seot a Mold in Replocing

LOOMIS: The same procedure applies to Linotype and Intertype. Clean the mold pocket thoroughly, as also the mold. Place in position and to the right. Tighten the four screws, then the three in the cap (or two, if Intertype). Then loosen four, tighten four. Loosen three, tighten three. This is as near as you can get to an identical seating every time.

Use only screwdrivers with good blades, unground by you. Work from the center screws out.

Changing Liners

HARDING: Make it a habit to clean out the flakes of old metal when you change liners. Scrape the spots off the liners with brass. Start a liner in, then bring the center screw down lightly, and tap the liner the rest of the way.

This will push out the loose metal to some extent.

When Mold Cap Screws Won't Hold

HARDING: In the first place, use good screws; in the second place, use a good screwdriver with a blade that will go down into the hole without reaming out the threads. Set all screws firmly but not desperately, or you will have a cracked disk.

If new screws will not work, you can get a 16x24 tap and screws to match from Wm. Reid & Co., 2271 Clybourne Ave., Chicago. No drilling is necessary. Just tap.

LOOMIS: Since the war I have known m-o's to have trouble getting this tap. In such a case, drill out the hole with a size F drill (or ¼", which is a few thousandths smaller) and tap with a 5/16x18 tap, which can be had at any hardware, also screws or bolts to match. You will have to saw off the bolt and make a slot with the saw, and it leaves a very thin edge at the front of the disk, but these seem to last indefinitely.

Why Are Nibs Knocked off Liners?

HARDING: Invariably this is due to up-and-down play in the ejector – generally on the old style solid blade.

Can Bent Liners Be Repoired?

LOOMIS: Yes, if the liner is only sprung and if you will use care. File off the crunched-up part of the rib so it will fit in the groove in the mold. Turn the liner upside down, with the slot away from you. Now file a little on the right side of the bottom of the rib. Do this until the liner will fit flush with the mold. And by the way, order a couple of new liners – one to be hidden in reserve.

HARDING: A slightly sprung liner will develop a low spot near the end, where it is constantly pushed back by the jaw, if you don't do something about it.

Why Are Slugs out of Square?

QUESTION: We have set and re-set the knives, but still our slugs are out of square. They bow up at the top, and a column of type has to have strips of cardboard dropped in before it will print. The floorman is yelling his head off. – S.A.S., Caledonia, Okla.

LOOMIS: This baby is my meat. I spent eight hours finding out what was the matter, and four hours more fixing it. If I had to do it again, I would tell them to order new molds – for this was the roughest work I've ever done.

The molds, hit many hundreds of times over the years by a heavy hand on the ejector lever, were out of square. The right-hand knife cut off too much rib. I finally laid the molds on stereotype casts, and with other pieces of cast to absorb the shock, punished those molds with a one-pound hammer. It was hard work and long work – but I got them square. I don't think it was worth it – but I was up against a press-day, and I do not like to go away from a job unfinished.

This could happen to you. It is shown by the fact that the left-hand knife does not touch the bottom of the slug, while the ribs measure to a definite taper. I advise new molds. Repair is a heroic measure.

Replacing the Mold Disk Locking Studs and Blocks

HARDING and LOOMIS: The studs should be oiled once a week. Grease collects chips of metal. It is easy to see when they are worn, for the ends look rounded and sometimes actually broken. Harding says to run the disk onto the blocks and try to pry up the disk with a heavy screwdriver in the teeth. If the disk moves, the studs and blocks are worn.

Necessity for replacement may be indicated by inability to hold a constant perfect trim.

New studs measure .350″, but measurements are deceptive, for the studs do not go all the way into the blocks.

Order four studs, four keepers, and four screws, and at least the right-hand block. On old machines the left-hand block is solid; on newer machines it has a little movement and so does not often wear.

Install the studs and tighten them firmly.

On an old machine, see that the gib under the mold slide allows free play (.006″ to .007″ – or back off the screws ¼ turn after tightening them). Set the mold disk guide support screw as instructed in *Setting the Mold Disk Guide Support Screw,* page 128.

Remove the knife block. Install the new stud blocks. Do not put the dowel pins in the blocks, and do not fully tighten the bolts that hold them.

Back the machine with a 30-pica mold in ejection position. Push the ejector lever forward with a perfect 30-pica blade in it.

Now you want to secure about .002″ clearance between the flat side of the mold and tbe ejector blade from top to bottom. This may take patience. Tap the right-hand stud block up or down. Test with a feeler. Sometimes you can

get .004″. Whatever it is, *there must be clearance,* or the ejector blade will score the mold. When you get it, tighten the bolts firmly and test again. If still right, turn the machine to normal and open the vise. Let us hope you have blocks with soft ends; most of them are now.

The dowels are 3/16″. For this job you will need a straight reamer of that size and use cutting oil. Drill the holes in the opposite corners from the old ones (you can also drill the old ones bigger, but this can be tricky) with a No. 14 drill (.182″), or a 11/64″ if the numbered drill is hard to find. Ream the holes with cutting oil to avoid getting them too big. Put the pins in and pray.

Try it again. If you have not moved the blocks, you will still have clearance between the mold and the ejector blade. If not, set the block again and go to 7/32″ or ¼″ dowels. If you get a block with hardened ends, you're a dead duck. You can do nothing but use the old dowel holes and hope they test out all right. Sometimes they do.

We didn't tell you before, but proper installation of mold disk locking studs and blocks is as ticklish a job as there is on a linecasting machine.

The question has come up: can we use a 3/16″ drill? The answer is: almost never, for the reason that a drill not sharpened with the point exactly in the center will cut a hole larger than 3/16″ — and very few drills, even new ones, are that accurate. Experienced machine shop men never use a drill of the size they want, if the fit is close, as a dowel pin fit should be. There is another way out, however. You can drill the first hole with, say a ⅛″ drill; and then, with a 3/16″ drill in good shape, that mikes not over .1875″, re-drill the hole. This way you avoid the off-center effect. Cutting oil will make the hole cut a little small in the cast iron of the frame, which should come out with a nice tight fit.

You can now check the first elevator jaws for parallelism with the molds. as explained in *Misalignment of Mats, etc.,* page 109.

Special acknowledgement is here made for advice from Harry Pottle of W.N.U., Chicago; Walter Severin of Intertype Corporation; W. J. Mulroy of the Mergenthaler Company; and to the veteran, George Cornell of Mergenthaler, who died a few years ago. Few have set more stud blocks than George Cornell.

When Do You Replace the Mold Disk Banking Blocks?

Loomis: There is no adjustment on these (two on a Linotype, three on an Intertype) (but see below). I replace one when it is worn down about .015″. The one Linotype block that I have available measures .940″ at the high point; this is just over 15/16″, and, as I recall, this is the original measurement.

Harding: The mold must not bank on these blocks at casting point, for that would interfere with the lockup. Test with red lead or a strip of paper. They do bank there at ejection, to act as a buffer for the breaking loose of the slug from the mold.

These banking blocks are located above and below the side knives. The Intertype has a third block in the middle. This is adjustable. Set it so that a strip of paper may be drawn from between the mold and banking block at the cast.

Snow on Molds ond Under Distributor Box

QUESTION: We have far too much metal gathering on the fronts of the molds. It is carried up also by the mats and falls in a veritable snow under the distributor box. — R.B.G., Horseheads, N. Y.

H. C. ROCKWELL in the *Graphic Arts Monthly:* This has its fundamental root in a lack of proper lockup. It may come from a warped mold, though not too often. It may be caused by spacebands in backward, rounded vise jaw corners, badly worn molds, mold caps pushed back out of line, a loose tie-bolt in the back, vise locking screws that work loose, mats with badly crushed side walls — all are causes.

Check the forward thrust of the mold disk, parallelism of jaws with molds, failure of the mold disk to relax between justifications. The pump stop should be positive in operation to prevent loose lines' casting. Keep spacebands clear and polished.

HARDING: A good front mold wiper helps. A broken pot lever spring contributes to the trouble. See that the pot retreats after the first lockup. Sprung mold posts will allow it, and a loose mold screw will hold the mold from the vise jaw. Spacebands are made thicker at the front by .0005" (one half a thousandth).

LOOMIS: I have found in many cases on old machines that "slop" in the forward thrust of the mold disk was responsible. This is especially noticeable on Intertypes, and they are particularly amenable to correction. See *Too Much Forward-and-Back Play in the Mold Slide,* page 126.

Will Floor Wox Help?

LOOMIS: As I write this, there has recently developed the idea of using Simoniz floor wax on the face of a mold and on the jaws to prevent accumulation of metal. I have been using this for about a year, and it certainly does retard the accumulation of metal on the molds, though it should not be expected to take the place of worn parts entirely. I am putting new cam rolls and eccentric pin in my machine, having last night found them far below my own prescribed tolerances.

Vibrotion in Mold Disk As It Goes Onto the Locking Stud Blocks

HARDING: May result from:

1. Screw in the square block (back of the bevel gear) loose.
2. A mold turning gear segment loose.
3. Clamping screws for the shoes are loose.
4. Mold driving brake is loose.

Why Does the Disk Vibrate As It Revolves?

LOOMIS: Lack of oil on the mold disk stud or too close a setting of the mold disk guide or guides. Check the guides. Try penetrating oil on the stud.

Oiling the Mold Slide

LOOMIS: The V slots, both top and bottom, in which the mold slide works, need oil. Normally this comes through an oil cup about half-way back, but on a lot of older Linotypes, although the boss is there, the cup is not. You now have the fun of drilling a hole. Take out the mold slide. Get a ¼" drill welded onto a foot of ¼" rod, and try to hit the apex of the V. Once the hole is there, remember to oil it.

Warping of Molds

Note: By all means do not fasten a gas torch under the mouthpiece and leave it there. This warps or cracks more disks than anything known. Do not leave a mold locked up on the cast. Molds are not designed for continuous heat of that temperature.

CHAPTER XV

THE MOLD TURNING MECHANISM
MOLD WIPERS

The Mold Turning Bevel Gear

HARDING: Questions are not often asked about this, but it is an important mechanism.

The set screw in the square block should be straight up at normal position, and should be tight. The flat-head screws in the two facings should be tight. When the machine stops with the spaceband pawl locked, a four-tooth side of the bevel gear should be up; one fourth turn later, three teeth will be up. The beveled teeth in this gear are not worn, but made that way.

Mold Turning Com Shoes

LOOMIS: These should not be scored or broken. The felt in the gear guard that lubricates the shoes should be kept oiled and touching the shoes.

Com Shoe Wiper

Many old machines do not have this felt. Order C-350, Mold Turning Cam Shoe Wiper Bracket, and C-349, Mold Turning Cam Shoe Wiper. With the gear guard in place, on the face parallel with the first elevator cam, drill a hole 5/32" or bigger, about 1" from the top point and 1/8" from the left edge. With a No. 8 screw and nut, fasten the wiper bracket *inside* of the gear guard, then fold the felt and poke it in with a screwdriver. Oil it.

Adjusting the Shoes

LOOMIS: Drop the first elevator to the vise cap and take off the gear guard. Back up the machine to test the play between the cam shoe and the facing. This is prescribed as .002" but I test it this way, for a feeler gauge here can be deceitful: Turn the machine until the facing is in the middle of the shoe; now take hold of the mold disk pinion (the one you use to change the molds) and wiggle it. There may be too much play between the two. Back up the machine, take out the large-headed holding screws, and turn the inside bushings in a little. Put the holding screws back and test again. If there is no movement

of the facing, it is too tight, and you can often see the cam bend out. At the proper setting you can see the facing just move, but not enough to let light through.

Needless to say, both ends of the shoe should be the same. Some m-o's use a mike here, but it is not always reliable. I test the facing at top and bottom, being sure that it is contacted by the full face of the shoe.

This of course must be done for both shoes (or three, on some machines).

This is a most important adjustment and should be made with great care.

Welding the Mold Turning Cam

LOOMIS: There was a time when we considered that a main cam had to be removed from the machine and pre-heated for welding – but no more. The mold turning cam breaks most often, and usually from too much pressure on the shoes. A *good* welder can weld it on the machine with either gas or electricity and without the expansion that we used to hear boogie tales about. Leastwise, the cam doesn't break in other spots, as we thought once it would.

Mold Disk Sometimes Fails to Turn

QUESTION: At intervals the mold disk does not make its quarter turn as the elevator descends, but the pot comes forward and casts on whatever mold is up. – T.E., Vandalia, Mo.

HARDING: The mold disk turning pinion is driven by a short stud entering it from the rear. This can become rounded off or it can get pushed back so it is too short; the bushing in its corresponding hole, where it should seat, often gets well worn at the sides, so the pin will easily slip out. Put in a new bushing and pin, and see that the pin goes into the bushing as far as it will.

Watch especially when changing molds. That is when much of this trouble originates.

Be sure the set screw in the square block near the bevel gear is firmly set.

Should We Oil the Mold Disk Turning Brake?

HARDING: Positively not. Oil destroys its efficiency. The leathers, if oil-soaked, should be replaced. You will see how by taking off the brake. The two holes are for the brass pins that hold the leathers – *not* oil holes.

The only adjustment on the Linotype brake is to loosen or tighten the nut against the spring. Adjust so that the mold disk, coming forward onto the locking stud blocks, does not have to jerk either forward or back.

It should not be necessary to say that metal accumulated behind the disk, or anything that tends to retard the disk, will throw this adjustment out of kilter.

Be sure you keep a small amount of oil on the mold disking locking studs.

On the Intertype there are two disks with leather between. Put an occasional drop of oil in the oil hole under the spring.

Whot to Use on Bock Mold Wiper?

QUESTION: Our Model 19 collects metal on the backs of the molds, although we run the wiper up against the disk as advised. We use no lubricant but dry graphite. – A.T.D., Mexia, Tex.

HARDING: It has been found that a dry wiper will not remove particles of metal. Your molds on the backs should be as clean and shiny as the day you unwrapped them, and if you find metal on them, scrape it off with a sharp brass rule; use alternate rubbing with mold polish, if necessary – though note that mold polish is not for steady use on a mold, for it contains an abrasive that will damage molds if used continuously.

Use oil on the back mold wiper; put it on the back side of the wiper, and if you don't load it, it won't foul your molds. Graphite worked into the felt helps to polish the metal. Apply a drop or so of oil to the front mold wiper too, though here, with a squirt can filled with gasoline and graphite, it is easier to load the felt with graphite. Trouble is, it doesn't last.

LOOMIS: Three cheers! For fifteen years I have been guiltily flaunting The Book (meaning established authority) by advocating oil on the back wipers. Now I am happy to see that I was not entirely alone.

A dry wiper will not do the job. Mold polish will ruin molds. Graphite alone won't stay. I ascertain that the felt is freely removable from the holder. If there are pointed screws in the sides of the holder, throw them away. Unless the felt is too small for the holder, it will not come out in use. Weekly I take out the wiper, put about half the equivalent of a film of oil on the front, and put the front in backward. I am glad to see that Harding and I worked out the same system on this. The oil works through gradually, and not enough to cause trouble unless you overload it. If you find oil on the liners when you change them, you will know you used too much or used it wrongly. Be sure to put the oiled side *in*.

As to oil: Ordinary lubricating oil will do a good job. The best, however, seems to be a sulphur-base cutting oil, such as the black threading oil that plumbers use – which is not oil and does not cut.

In recent years I have been experimenting with the same oil on the front wiper, which I considered very daring, only to see that others were doing it too. I use cutting oil here also, and apply it as far back on the wiper as possible. I use more than a drop – about one "string." The main thing is not to use enough to get on the mats, for that will require a cleaning of mats and magazine and all the places where the front toes and ears slide.

Slug ejection is easier from a mold with a lubricated back wiper.

Be sure your back wiper bears against the disk at normal position. It should be set so that the usual spring that holds it there is lightly compressed.

On wipers that are not removable, I put a little oil as far back on the side of the wiper as possible, through the slot in the disk.

Some use castor oil, but I have used that on Monotype casting equipment and I don't like it. It is a fine lubricant for molds – perhaps the best – but on being heated it leaves a gummy residue.

HARDING adds: Avoid any presence of oil in the mold cell or on lines. This is a good guide.

CHAPTER XVI

METAL POT AND PLUNGER

General Action of the Pot

QUESTION: I was visiting in another plant and noticed the pot went up into position and stayed there until after the cast. The pot on our own machine drops back for a second and then locks up again. The other operator assured me our pot is not locking up right and I should change it. What do you say? – L.R.M., La Jara, Colo.

LOOMIS: For goodness' sake don't touch it. For a fuller description of the action of the pot, see Pottle's article below. It is well to be familiar with the exact action, for often casting trouble can be run down this way.

H. G. POTTLE in *Who's Who in the Composing Room:* Let's take the first look at the pot cam in the back. It has two shoes; a short one which moves the pot forward for the first alignment. Then the pot drops back for an instant before it is brought forward by the second and longer shoe, which holds it there during the cast.

This long shoe locks up against the roll on the pot lever and exerts pressure against the pot lever spring at the bottom. This spring transmits pressure to the pot itself.

The old-style eyebolts have a nut at both ends. The nut at the rear does not have anything to do with the pressure exerted by the pot lever spring, but rather it brings the pot back for that momentary relaxation between lockups. If this nut is backed off too far the pot will not drop back properly. On an Intertype this nut is set so there will be 11/64″ space between the nut and the lever when the pot is locked up; this is just under 3/16″. On a Linotype the space is 1/16″ to 1/8″. This nut should have a lock nut to hold the adjustment.

The front nut is the one that determines the pressure during lockup. It also should have a lock nut. On late Intertypes it has been replaced with washers, of which there usually are eight on a new machine. The new style springs are larger and are under pressure during lockup only; therefore they should last longer.

LOOMIS: It is distressing that in the past both manufacturers have not required more accuracy in the manufacture of the pot cam lever, pot lever eyebolt, the sleeve, the washers, and the nuts. A man out in the country, taking his eye-

bolt apart to replace a broken spring, often has been dismayed to find that the pins holding the sleeve have been sheared off or removed, and on occasion I have seen sleeves on eyebolts without any holes for pins, not to mention eyebolts without sleeves *or* pins. These conditions are, shall we say, confusing. See the heading, *Lockup Pressure of the Pot,* page 147, for suggestions on what to do next. (I understand that recently the manufacturers have introduced some uniformity into the dimensions of this assembly.)

Proper Filling of the Metal Pot

QUESTION: Is it all right to let the metal level run down near the top of the well? We get a cold face if we run it any higher. — H.C.H., Frederick, Wis.

HARDING: This should not be done as a custom. You need a machinist if you are having that trouble, for probably you already have a clogged throat. We give a fuller treatment of this subject under the heading, *Cold Face Caused by Throat Clogged,* etc., on page 183, but don't get in a hurry to clean out the throat until you have read all the material in these chapters on the pot.

In the meantime, as to your question: different pots do vary a little, especially if you demand a great deal of them, as in casting big slugs, big faces, and many slugs. But in general, metal should be kept in the neighborhood of 3/4" below the place where the crucible meets the pot — or 1¾" to 2½" above the top of the well. On an Intertype, the metal level should be below the bevel at the top edge of the pot.

A pot holds about 38 pounds of metal when full, but this is by no means workable. If you are hand-feeding, drop in a pig whenever you are up. Don't let it vary more than you have to.

When the pot is too full, you may get a back squirt, for metal will run out of the mouthpiece holes as the pot moves forward. When a pot runs over, metal runs down through the asbestos packing. On old style Linotype pots with their throat heater terminals at the bottom, short circuits resulted. One pot that I took apart had fifeen pounds of metal that formed a regular jacket around the throat element.

Fuses have been blown by metal splashed from the surface through the opening through which the old style mercury tube passes, and out over the electric connections. A "hot spot" in an element has been known to splash metal onto heater terminals (it has even blown metal to the ceiling). When this spraying persists, throw a handful of slugs over the "hot spot" when you turn on the current.

A cut in *Printing Equipment Engineer* for August, 1939, shows an accumulation of slag or dross in a crucible throat, caused by allowing the metal level to remain constantly too low. This sort of accumulation becomes almost as hard as the iron itself, and, if it gets too solidly established, is hard to loosen.

LOOMIS: I ran into one of these crucibles once that had a solid accumulation of dross in the throat. We could not remove it even by heating the crucible red hot with an acetylene torch, and so we sawed it open and found the same thing William Reid & Company found. In my opinion this accumulation was caused by two things: 1, allowing the metal level to remain constantly low, and 2, allowing a heavy accumulation of dross to remain on top of the metal. These two factors over a period of years, plugged up the throat, I think. Questions asked of the owner seemed to support this theory. I do not believe that deteriorated metal had much to do with it, for if that were so there would be many more of them. I have cleaned out — well, hundreds — of throats in the last thirty years, and that is the only really bad one I have seen. It is something of a freak — but it could happen to you. And when it does happen, it's bad.

I hurry to point out that it requires only a very little dross in the throat to give a cold face on your slug — and this dross yields to the throat saw, of course.

Temperature of the Metal

QUESTION: We changed over to bottled gas, and after the orifices were installed we discovered our thermometer was broken. What would you suggest in a spot like this? — Q.R., Crawford, Neb.

LOOMIS: In a situation like this it is possible to get a pretty close adjustment of the heat without a thermometer. If it is a gas pot, be sure the throat burners are burning; if an electric pot, be sure the throat and mouthpiece elements are heating (if you can get metal through the mouthpiece, they are).

First set it this way: fold a piece of newsprint and hold it in the metal while you count slowly to three. The paper should be light to medium brown. The trouble is, newsprint varies, counting varies, and each man's idea of light brown varies. An old hand at this, who has checked it often against a thermometer, can come within ten degrees, but it isn't so easy for the inexperienced. Cut down your mouthpiece flame pretty low, or, if electric, to about the halfway point. Start setting type.

Pay first attention to the pot. Keep cutting down the main burner until a ball begins to form on the plunger. Then turn it back up a little until the ball disappears.

The throat flame should be from 1″ to 2″ high.

Now the main pot heat is pretty close to where it should be. Cut down on your mouthpiece heat until it starts to give a cold face; then raise it again.

With a little experience, this can be as good a setting as you can get with a thermometer — always allowing for exceptions caused by unusual conditions (under which circumstances a thermometer can be pretty helpless too).

For the record, it is now considered best to run the pot as cool as you can and still get good results. This will be around 510° to 530°. It must be hot enough to keep the ball off of the plunger — though sometimes you have to use an aluminum shield as assistance here. The temperature prescribed for the mouthpiece is 490°, but this is hard to measure. A 6-point slug held with one edge against the mouthpiece should start to melt in less than a minute.

In a Monomelt, it is now considered best to keep the temperature around 625°. At higher temperatures the metal will be oxidized with excess rapidity. At lower temperatures you may have trouble melting down fresh metal.

Metal Temperotures and Mold Cooling

HARRY G. POTTLE in *Who's Who in the Composing Room:* 530° is a safe low temperature with a cold-metal feeder; with a hot-metal feeder the temperature can go down sometimes to 510°. I have always favored a low heat in the pot, with plenty under the throat and mouth-piece. I have had excellent results by feeding gas to the throat burners independent of the main burner.

Mouthpiece temperature is supposed to be 475°, plus or minus 3°. So far this is difficult to measure and difficult to hold.

A mold is overheated beyond 150°, so when large slugs or continuous slugs or fast-running machines are involved, cooling is needed. Water cooling offers little cooling to the cap of the mold. (LOOMIS: The upkeep of a water cooling system is demanding too.) Air cooling helps both cap and body, and in general seems to have turned out to be more efficient in cooling.

Hollow slugs can be caused by lack of ventage. These usually have a bottom, but are like a shell and are hollow inside.

I have better luck with a mouthpiece that has holes a nonpareil apart instead of a pica apart.

Lockup Pressure of the Pot

QUESTION in *Printing Industry* for November, 1931: I removed the pot lever to grease it, and then decided to take the spring assembly apart for cleaning. To my consternation, I discovered there was nothing to reset the spring by. There was a sleeve, but there were no holes in the shaft. I got it running but it doesn't sound right. How can I get it set properly? — C.J.V., Mason City, Ia.

HARRY G. POTTLE: Unfortunately not too much has been done to provide a standard lockup pressure. We measured levers, eyebolts, washers, and springs in a plant of eleven machines, and on no two machines were the measurements the same. The springs vary. A Linotype spring has 7½ coils of ¼″ wire wound to 1 5/16″ diameter, and should be 2⅜″ long, but sometimes a new spring will be 1/16″ short. Also, the springs will become set in use and turn out ⅛″ short.

The Intertype spring has 4½ coils of 5/16″ wire wound to 1¾″ diameter, and is only 2¼″ long; this larger spring is not supposed to suffer from spring set.

The Mergenthaler Company uses a compound lever gauge to set their pot springs, but this is not available to the m-o, and it would require considerable experience to use it properly. The pot spring is set for 550-650 pounds pressure on the mouthpiece while the pot is cold; this automatically increases to 900 pounds when the pot is hot. Many machines have been tested where the spring had been tightened up to 1200 pounds cold. This can be done easily, for each turn of the front nut increases the mouthpiece pressure 200 pounds. It is well to note, however, that excessive pressure does not help back squirts, but often makes them worse by springing the pot legs.

The pot spring of course should not be solid. It is put there as a safety cushion, and when you screw it too tight, undue pressure such as a double black lockup will break off the vise locking screws or the pot lever itself.

Since the prescribed measurements are not dependable, what then can we do? As good a rough test as any is the space between the coils of the spring at lockup. This should be not less than 3/64″ and not more than 1/16″. When it is set and found to work, the lock nut should be checked to be sure it is tight.

LOOMIS: I made a small gauge that could be used without so much trouble, using another pot spring as a sort of counterbalance, and used it for a few years to check on Pottle's distance between the coils. That seems to be about right, and I don't use the gauge much any more.

Earlier I had tried to establish some sort of basic measurement. I chose the distance from the front edge of the pot spring to the nearest edge of the hole in the pot lever eyebolt. Like Pottle, I found no two alike. They measure anywhere from 1½″ to 1 13/16″ at this point. A Model 14 in the plant where I am now working measures 1-11/16″, while a brand new Intertype measures 1½″. My own choice on an older machine is to guess at about 1¾″, then set it according to Pottle's test. Get a piece of 1/16″ rod – the size of the mouthpiece holes. If that goes between the coils during the lockup, the spring is too loose. Grind a flat on one side until it measures .047″ with a micrometer. If this end *won't* go between the coils at lockup, the spring is too tight. Save the rod; one end is the go-gauge; the other is the no-go.

Greasing the Pot Lever Roll

QUESTION in *The Graphic Arts Monthly:* Our machine stalled recently, and the machinist we got on the job found a broken roller bearing in the pot lever roller. I have been careful to oil it every week and am at a loss to understand why it ran dry.

LOOMIS: The pot lever roll must be packed with grease. Because of the heat from the pot, oiling will not keep it lubricated. The old style bearing has

nine separate roller bearings and two washers. The new style has the bearing assembled.

Some m-o's put shims under the pot cam shoes to compensate for wear, but I believe this should be done only on the advice of an experienced machinist, for each shim has the effect of tightening up the pot spring three times its thickness; therefore a sheet of tympan paper adds from 40 to 50 pounds pressure at the mouthpiece. Moreover, those shoes are case-hardened and do not wear very fast.

To remove the pot lever: Drop the first elevator to the vise cap. Turn off the motor. Note the exact position of the pot balance spring base, under the pot lever, and pull the vertical balancing spring out from under the pot lever. Open the vise and pull the mold slide out a few inches. Block or tie the metal pot forward. (Blocking is easier, for you can saw a wedge-shaped block of cut-base, 4″ long, 8 picas wide at one end and 15 picas wide at the other; then push the pot forward and slide the wedge in between the pot and the pot pump roll. But this will be in your way until you acquire experience, so it is perhaps better to tie a piece of baling-wire around one of the brackets that hold the pot cam lever and then run it through the face plate.)

If a Linotype, note the number and position of the spacing washers on either side of the pot lever where the shaft goes through. Look closely. Some of the washers are very thin. (If Intertype, remove the screw in the slot at the top of the pot lever.) Now loosen the set screw that holds the pot lever shaft, stick a screwdriver through the hole in the end of the shaft; twist and pull. You may need penetrating oil. Be careful to catch the washers. Lay them out as they were in the machine.

Remove the wingpin from the eyebolt under the pot. If it has rusted in, squirt it with penetrating oil. Do not pry under the wing. Grasp it with pliers, and twist and pull. Catch the pot lever with the left hand while you remove the wing pin. Let the pot lever come down and out. Note that by leaving the wingpin in until the last, you were able to handle the washers much more easily. This is also true when replacing the washers; put the wingpin in first, and you won't need three arms as much as you might at first think. Take the pot lever to the bench. Tighten the two screws that hold the pot return cam. Make them good and tight. Loosen the set screw that holds the pot cam roll pin; some fit into a detent; others are very long and go all the way through the pin. Push out the pin; the anti-friction rolls, washers, and cam roll will fall out.

See that the two oil holes in the top of the pot lever are open. If they are plugged up with metal, drill it out with a No. 28 or 29 drill, or a ⅛″ drill.

Wash the parts in kerosene or gasoline. Use a good cup grease or hard oil (not axle grease) and pack it around the inside of the roll. If the anti-friction rolls are separate, stick them one at a time in the grease. Then fill in the cracks. (With an assembled roller bearing, put it in the cam roll and then, with grease on your finger, go around and around until all the spaces are filled. Stick the

washers in place. Slip the roll in place. Get it centered on the hole. Then shove in the pin, with its hole in place for the set screw. It may be necessary for you to plug the hole with a piece of paper to keep the rolls in place, but you should be able to do it with grease alone.

Tighten the set screw just snugly; it is hardened, and if you break it, it can be quite a problem to remove. Put the pot lever back in place from beneath the pot and slip in the wingpin to secure it. Now coat the upper washers with grease and put them in place and push the shaft through. On an Intertype, insert the set screw in the slot and then adjust the pot lever sidewise to prevent rubbing against the cams. On a Linotype, if it rubs, you will have to shift washers. (On an Intertype, of course, there are no spacing washers.)

Let the hole in the pot lever shaft protrude from the bearing, in preparation for next time.

If you should break the wing off of the wingpin before you read this, you can loosen the pin with penetrating oil and drive it *from the inside* with a very short punch and considerable patience.

We assume, of course, that if any of the rolls are out of round or cracked they will be replaced. If the cam roll pin itself shows a worn ridge, it should be replaced.

After a few greasings, one should be able to remove the roll without removing the pot lever, and grease it and return it — all of which won't take more than a few minutes, and makes the job easier. In this case, take a long, thin screwdriver and push the cam roll pin toward the pot side of the machine. Get hold of it with a pair of pliers.

As to frequency, I know The Book says this roll should be packed twice a year, but I never have seen one that was, and I don't believe they need it that often in the country. I don't think oiling should be demanded any oftener than necessary, because the m-o has his hands full anyway. He passes it up for a few months and then forgets it completely to get it off his mind. Therefore let's say once a year, for it does need it that often — and let's do it that often.

Incidentally, make it a practice to oil the wingpin and eyebolt when you oil the machine; then you won't have any trouble getting the pin out.

For grease, do not use any form of pressure-gun lubricant. I have recently heard bad reports from graphite grease also.

THE PLUNGER

General Action of the Plunger

HARDING: Normally the bottom of the plunger is just above the holes in the well. Then as the pot moves forward, the well moves up and the plunger

cuts off the holes. You should be able to push the pot well hook through the holes with the plunger in place in normal position. If the plunger rides too low because of a worn pot pump cam and cam roll, the holes will never be fully open, and continuous casting will produce hollow slugs.

To remove the plunger, twist a little as you pull it out — and don't pull it out too fast. If you are careless, some machines will allow metal to splash from the mouthpiece, which will cause a squirt.

LOOMIS: For the best possible face and body, the plunger should start down with a quick, free stroke, then "dwell" and follow on through its stroke until the lug on the pump lever is within about ¼" of the top of the pot jacket. This stroke is regulated by drilling a hole in the bottom of the plunger. Clamp the plunger rod in a vise, with the plunger itself tight against the side of the vise. Start in the concave curve near the middle of the plunger at the bottom. Drill into the center at an angle. Start with a No. 52 or mouthpiece drill. Try the plunger with a 30-pica 10-point slug. Drill larger if necessary. If you get the hole too big — sometimes they take up to ⅛" — you can plug it up with a cotter key inserted from the inside. Cast slugs for several hours after each drilling.

It is important on some machines to get this full stroke of the plunger, for if the plunger goes down "soft" and doesn't go all the way, pressure on the pump after the cast may cause an "after squirt." This will lead to a back squirt.

Note also that on an old machine that is running all right, it is wise not to monkey with the plunger. It is usually when the shop gets a new font of bigger or heavier type that this becomes necessary.

On an old crucible and plunger, you may run into trouble trying to give the plunger a full stroke, because the plunger may have worn a groove around the well or there may be a dross ring at the bottom of its down stroke.

Proper Method of Cleaning the Pot and Plunger

QUESTION: I have heard many different and conflicting ideas on cleaning the pot and plunger. Will you give me the straight dope? — D.G., Slaton, Tex.

LOOMIS: Glad to. First, use no goo of any kind on the plunger. I have never been convinced that it is helpful in any situation. For a well-cleaner, use either the two-bladed cleaner or the spiral cleaner where the ends of the wires do not stick out. If you use the blades, keep the fork sprung apart, and replace blades when they get worn. The old-type wire bristle cleaners are treacherous; they sometimes leave short wires in the well that later get caught between plunger and side-wall.

Use the pot hook to clean the two holes in the sides of the well.

The best place I have found for the plunger pin is in the end of the face plate just under the screw that limits the travel of the line delivery.

I favor the spiral wire brushes where there are no loose ends sticking out. The solid scrapers are good but m-o's in the country are inclined to use them when they have lost their spring or when the blades have big grooves in them so they could not possibly clean the well.

Brush the plunger with a wire brush, in the open to avoid breathing the dust. Do not immerse in water or oil and do not use any sort of dressing on the plunger. It is totally unnecessary. Skim the pot and put the skimmings in the Monomelt or remelting furnace.

In replacing the plunger, immerse it in the pot for a couple of minutes to warm it up, then work it in, twisting a little if necessary. Put the plunger in gently, or you may force a little metal from the mouthpiece which will cause a back squirt.

LOOMIS: It is good policy, as George Curle showed me on the old *Tribune*, not to clean loose and worn plungers and wells any oftener than necessary. Let them gather dross to eliminate slop, and clean them only when they have to have it.

Adjustable Vent in Plunger

LOOMIS: For a few years plungers were made with an adjustable vent in the bottom to secure the same result as had been secured by men in the field who drilled holes in the plungers. If you have an adjustable plunger, and if you can adjust it, it will save drilling. But ordinarily it is more trouble to loosen the screw than it is to drill the plunger.

Metal Collects on Plunger Rod

QUESTION: Metal constantly collects on the plunger rod. Can you tell me how to get rid of it? — E.O.W., Excelsior, Minn.

LOOMIS: The accumulation of metal on the plunger rod varies a great deal with different machines — possibly from variation in the metal formula. First, check the temperature. Often if you set the metal at 530° it will stop this. Sometimes a plunger with a good long stroke will be a constant offender. If it doesn't help to raise the heat, then get an aluminum sleeve from the company. You will need also a new plunger pin keeper spring. Take out the old spring, slip the sleeve over, put in the new spring. Usually the sleeve fits snugly enough to stay where you put it. Otherwise you can drill a couple of very shallow holes in the rod and pound the soft metal into the holes.

To get a metal ball off of a plunger rod, either dunk the ball beneath the surface of the metal, or take a large screwdriver and pound it gently alongside the rod, between the rod and the metal, until the ball drops down the rod below the metal. This can be done so it does not smack of strong-arm methods. The word is *gentle*. A still gentler way is to take out the plunger pin and twist the

plunger down into the well until the ball is submerged – taking care not to force metal out through the mouthpiece.

HARDING: This is apt to appear on plungers that have the long stroke about which we have talked, because the cooler part of the rod dips into the metal. You may have to increase the temperature. Some pots are worse than others at it – probably because of a difference in the composition of the metal. Have the metal analyzed.

Plunger Becomes Disconnected

There are several things that will make a plunger become disconnected:

1. Cold metal.

2. Dirty plunger and well.

3. Metal slugs or pigs dropped behind the plunger rod, or a ball formed on the plunger rod.

4. Weak plunger pin keeper spring. This should be made of spring steel. Coat-hangers are more handy but not as efficient in this spot. Get half a dozen springs at a time. They are not expensive.

What to Do With a Stuck Plunger

HARDING: When the plunger sticks tightly in the well it usually can be dislodged by putting a monkey wrench on the rod and twisting and pulling. When this method fails, dip the metal until the well is exposed, put a little beef tallow around the plunger, and repeat with the monkey wrench. If the slug on which the plunger sticks is not the first one cast, tap the plunger rod lightly with a pig of metal and again use the monkey wrench. But if the plunger sticks on the first stroke after cleaning (which would indicate it is binding on some foreign substance), tapping the rod will make it worse.

Put a rod through the upper hole in the plunger rod, cover the opening in the pot cover with a cloth, and tap the plunger up. Cases have been known where the end of a side-stick was forked and used as a pry in the lower hole. Be patient.

LOOMIS: Be careful in twisting on the part of the rod above the plunger pin. I have seen the rod twisted off there. The very best and most consistent results I have obtained in this fashion: Loop several turns of baling wire through the upper hole so that you can put a three-foot crowbar through the loop and get a hold with the end of the crowbar inside the column. Now pry up hard while somebody else uses a monkey wrench or large crescent wrench to twist the rod (below the plunger pin hole if possible). I have seen some very stubborn plungers come unstuck through the persuasive power of these combined pressures.

There is one more way to withdraw a stuck plunger, but it can be very dangerous. The back of my right thumb is a solid burn-scar to prove it. Do this only if other methods fail.

Get somebody reliable to handle the clutch. Close the pot-top. Pad your right hand thoroughly with rags. Let the machine turn over until the plunger is down. Then grasp the plunger rod just above the plunger lever with a BIG pair of pliers; you'll need the leverage. If your machine has a Monomelt, be sure your hand is padded on that side. Have your partner pull out the plunger. If you maintain your grip, the machine most likely will pull the plunger out. I haven't seen this fail — but remember, it is dangerous. It is not a thing to do habitually.

To Remove the Plunger Spring

HARDING: To remove the old style Linotype spring, remove the plunger pin, insert a heavy nail through the rod above the bracket, run the machine and hold out the pump stop until the lever descends, and lift out the spring and rod.

To remove the new style Linotype spring, loop a rope through the upper ring of the spring. Hold out the pump stop and run the machine until the lever descends. Climb up onto the machine and pull the rope straight up through the center column. An assistant can then push the spring off the hook on the lever. Do not leave the metal pot locked up more than three minutes.

To disconnect the Intertype pump spring, close the vise jaws, run the machine until the pump lever descends, insert a screwdriver in the hole in the top of the spring rod and unscrew the rod. The lower end of the spring may be screwed off the bracket, but this is not an easy operation.

To Put Back a Linotype Plunger Spring

LOOMIS: I have what I think is the world's best system for replacing a Linotype plunger spring. First turn off the mouthpiece heat. Then get some No. 14 insulated wire and make it into a double loop about 16″ from end to end. This will, of course, require a piece of wire about 6 feet long, to allow some for fastening together. Get a bar or rod about two feet long. Have your assistant stand on top of the machine where he can pull up from the top of the spring. Have him put the rod through the wire loop; hang the spring on the bottom end of the loop. Provide yourself with a big screwdriver — about a 12″ (that is, a screwdriver with a blade 12″ long and proportionately wide and thick). Hook the bottom end of the spring and have your assistant tighten up to hold it in place. Pull the plunger pin. Turn the machine over; hold the pump stop open until the plunger lever goes down. Stop the machine; shut off the motor. Go around behind the machine. Have your assistant pull up on the spring. When the loop is high enough, you can push the screwdriver blade between

about the third and fourth coils from the top of the spring, push it first away from you, then to one side, and finally bring it back over the lever. Get it into the notch you want. Then let your assistant get down, and untwist the wire if necessary to get it loose from the spring. Get the machine off of the cast. This should not take more than three minutes. If it does, you'd better turn the machine over and let the mold cool off — or do this when the pot is cold.

To change the spring from one notch on the lever to another, grease the notches, then use a big screwdriver if it has steel all the way through, or a small sidestick, and drive the plunger spring from one notch to another, using the drift pointed a little upward to make it easier.

How to Set the Plunger Spring

Loomis: The setting of a plunger spring is always a compromise between a solid body and a good face. The average machine works about right with the spring in the second notch from the front, if a Linotype. On an Intertype you can guess at a setting by using a ¾" or 1" rod, with one end through the column of the machine, to pry up the plunger lever and feel the pressure of the spring as compared to other machines. Other things being equal, too much spring will give a better face but a body inclined to hollowness; too little will give a fuller body but an indifferent face; and far too little will give a shell cast, or a slug that looks good but has nothing inside.

If you have a heavy fourteen-point, use the spring strong enough to get a good face on the bold and no more.

Many older Linotypes (Model 18, anyway) have a hook at the bottom end of the plunger spring that can be regulated (when the plunger is off the lever, of course) to give more or less pressure.

The oversize plunger springs sometimes help when your well and plunger are badly worn, but they have disadvantages too. They will often start leaks in a mouthpiece that hasn't leaked in twenty years — so I generally stick to the conventional type. These certainly will function if the pot is in proper shape.

To get a better face on 18-point and bigger, see *Quick Drop,* etc., on page 184.

Will the Quick Drop Cause a Cracked Crucible?

Question in *The Graphic Arts Monthly:* About a year ago we put quick drop equipment on our machines to give us better faces. Two of the machines have had cracked crucibles lately within a month of each other. Did the quick drop have anything to do with this? — L.R.M., Berea, Ohio.

Harding: A loose plunger acts as a cushion, and a snug plunger conceivably might cause a pot already partly cracked to leak on a quick drop, especially if you are using a heavy plunger spring.

Most crucibles crack on gas-heated machines. Did you ever hear of a cracked electric crucible? The gas pot heats from the bottom, and there is terrific expansion there until the top is melted through. On gas pots it is quite common for some metal to leak through at every melting; this probably is forced through the cast iron by the pressure. It is best to leave gas pots burning as much as possible. It helps also to let the metal run low before turning off the pot at night.

Cracked crucibles will allow metal to drop on the burner, especially each time the pot is heated, and some become so bad they plug up the burner.

Pat Relief Plug Will Help Prevent Cracking

HARDING: The old-fashioned pot relief plug used on gasoline pots is a good item to prevent cracking. A local mechanic can make one on a lathe. It is a cone-shaped piece of steel 12" long, 1¾" in diameter at one end and ½" in diameter at the other, with the taper running for about 6". Crosswise through the large end drill a ⅝" hole for handling. The plug should be smoothly polished from top to bottom.

Put the plug in the well after dipping the metal down to the well. Small end of the plug goes down. With such a plug in place, a crucible will seldom crack when heating up.

Can A Cracked Crucible Be Repaired?

QUESTION in *The Graphic Arts Monthly:* Kindly inform me if a leaky Linotype pot may be successfully repaired. If so, what is the procedure? — S.E.M., Canandaigua, N. Y.

HARDING: Repairing is not too successful. It may last for a time, but eventually it gives way in most cases. Use it in an emergency, but don't depend on it. Constant expansion and contraction will break it again.

Sometimes the throat will be cracked inside the crucible, in front of the well. This may cause loss of compression and poor slugs.

There are a number of compositions to stop small leaks, but do not be disappointed if they do not work:

Liquid glass and asbestos cement mixed to the consistency of putty; chloride of lime mixed with water; a saturated solution of hydrochloric acid and pure zinc; lye and salt, mixed with water; epsom salts and table salt, mixed with water.

These should be applied from the inside of the crucible and left to stand overnight. The crucible of course must be emptied and removed in most cases.

Sometimes copper has been pounded into the crack from either or both sides. But the solution of HCl and zinc probably is the best bet. Clean and scrape out the crucible and pour in the solution. Let it stand. If it will seep through the crack, so much better. Try several applications.

Loomis: Cracked crucibles are tricky. On the *Minneapolis Star* I saw one develop in a machine that had been moved only a hundred feet along the floor on one of those very low trucks furnished by the company. Nemo Wraggett was very unhappy over that, for he already had his hands full with thirty machines on the move. We never could fix that, and finally put in a new crucible. On the other hand, I saw a pot on a Model 15 in an inland town near Mobridge, S. D., where the well was cracked three fourths of the way around at the base until you could stick a paper clip into the crack. I couldn't figure out how it stayed on at all. But there was nothing else to do, and a paper to get out, so we went to the local welder. He used electricity to avoid heating the entire piece so much, and welded it all around. It worked for a long time, but I doubt that it is working now. I have even had the end of the crucible welded up and have filed out a new seating for the mouthpiece, and have seen it work. But most cracks are almost infinitestimal. You have to examine the iron closely to see them. My policy is: yes, weld it if you are in a hurry, but order a crucible and be sure. Electric welding seems best if you have to weld.

Dross Ring in Well

Question: Our plunger will not descend past a certain point, even though I have drilled a hole in the bottom. Do you know what causes this? — R.A.B., Lyman, Neb.

Harding: I think so. Your well cleaner has become too worn to do a good job of cleaning, and a dross ring has formed at the bottom of the plunger's former stroke. Make a scraper by welding a segment from a 2" washer onto the end of an iron rod, and scrape the ring out of the well.

Should We Leove the Pots on Overnight?

Question: Is it cheaper to leave the pots on at night or to turn them off?

Loomis: I am informed that in average cases, where the machine is used about eight hours a day, and then is heating for ten or eleven hours during the day, that there is no saving in turning them off at night. Bear in mind that the heat required to keep a pot up to temperature without new metal being added is not as great as that required when the machine is in operation; remember also that the heat required to melt down a cold pot is considerable. Where a pot is turned off for three or four days over the week-end, it is a different story.

Two years after writing the above, I got my model 15, and kept careful records. It is heated with 110-volt A.C. current, and has an electric Monomelt. I discovered the following startling facts:

1. It requires 4 kilowatt-hours to melt the metal, ready for casting. The main pot melts in 45 minutes, will cast in one hour with the mouthpiece set a little below half-way, where it runs, and the Monomelt, if the metal level is

allowed to run down a little, takes 15 minutes longer. If the Monomelt is full, it takes 1½ hours.

2. During fairly steady operation of the machine, comparable to the average shop, this machine consumes 1.7 kilowatt-hours of electricity per hour.

3. Overnight, when the machine is idle, the electricity consumption is about 1.6 kilowatt-hours per hour! This difference is roughly the difference of the motor and light.

Therefore the cost of melting down from scratch is only 2 kilowatt hours — the amount required to heat normally for one hour!

Perhaps during the melting-down process most of the heat is retained in the metal, while in the fluid state there is great radiation and loss of heat. This whole thing is a little hard to believe, but the figures are accurate according to my meter.

I have no actual figures on gas consumption, but I would not be astonished to find them similar.

CHAPTER XVII

LOOSE PLUNGERS
LINECASTING METAL

Symptoms of a Loose Plunger

What are the symptoms of a loose plunger?

1. Metal boils up from the well when the plunger descends. Occasionally this will happen on a good plunger with a strong plunger spring, but

2. Measure the plunger itself. If it is smaller than 1.996" at any spot across the bottom (or top), it is probably too loose for a good cast.

3. A tendency to hollow slugs, especially on 12-point and 14-point slugs.

(Note that this is not the hollow slug that results from recasting or excessive heat, nor yet the hollow shell that appears gradually when the plunger sits below the holes in the well. This condition will show up on practically the first slug cast. Break the slug with your fingers. You will see hollow places inside. The weight, of course, is a giveaway. Pick up a handful of slugs and heft them. Check heat and metal level. It is well to note here that the slug cast from a pot with a very low metal level will be distinguished by a perfect bottom and exterior but an extremely hollow interior.)

4. The base of the loose-plunger slug will sometimes have actual holes where the mouthpiece holes should be seen, says Harding.

5. Changing the temperature or the plunger spring has little effect on a loose-plunger slug.

Remedy for a Loose Plunger

QUESTION: Our plunger is loose and will not cast a solid slug on 14-point. An operator in a neighboring town has advised me to get a reamer and enlarge the well; then, he says, I can get a selection of oversize plungers and use the one that fits. Do you think this will end my trouble? — S.T., Wewoka, Okla.

LOOMIS: In the 1930's, following the widespread use of 14-point in country shops, I began to take cognizance of a common situation created by a loose plunger. On 8-point, 13 picas, or even 30 picas, the machine would deliver a good slug, but on 14-point, 30 picas — and this was especially true with the solid

molds which were generally used at that time — the results were not good. The machine often formed a slug which was hollow and which actually would cave in on a 10x15 platen press.

At that time the only remedy was to buy a new crucible and plunger, and the parts plus installation would represent around $200, not to mention considerable disruption of the office. Before long a number of service companies evolved systems of boring the wells on a lathe or drill press, but this involved either considerable delay or expensive trade-ins.

At that time, too, various manufacturers put on the market, for sale or rental, reamers designed to enlarge the well in the shop for the fitting of a plunger. Such plungers came in oversizes — .002", .003", and so on, up to about .010", with .015" considered an extremely big plunger.

Those reamers were inadequate, I found, for three reasons: 1, they did not have a guide that would do the job; 2, they required experience not possessed by anyone outside of a machine shop; and 3, they were not the right type and not heavy enough. They would hardly do more than scrape off the dross. If you set them to dig deep enough to cut, they were not heavy enough and would chatter, and the hole would no longer be round but polygonal. (I go into this history because there is still very little sound information on this matter over the country, and in order to show the proper way to ream a well, it is necessary, I have learned from experience, to show the m-o why the other way will not do the job.)

Presently I was rebuilding machines for sale. Through the generosity of George Curle I borrowed one of those light reamers from the *Minneapolis Tribune,* but found it did not satisfy my requirements. The C. H. Edlund Co., where I worked, had about a dozen discarded crucibles on which I could experiment, and with the advice of George Peterson, an experienced machine shop man, I ordered an adjustable reamer for the then fantastic price of $42, and George made a guide for me. I started to work on the old pots, and soon discovered that I did indeed have a sound approach. Refinements followed.

Things I discovered: a new crucible is bored at 2.000", and a new plunger is 1.998". After ten or fifteen years the well is worn elliptical, sometimes wider at the front and back, occasionally at the sides, always much more at the bottom. The plunger does not wear as much, but usually most at the bottom. If the plunger is .005" undersize at the bottom, the well will be at least .025" oversize at the bottom, while the top of the well will be only .002" to .003" oversize. This undoubtedly is the origin of the .002" oversize plunger. A few years ago machinists would get such a plunger and "grind it in" with emery powder — but the true fact is that very few wells that give trouble can be made parallel under 2.035". Many have to go .050" oversize. I confirmed all these facts by measurements with inside mikes and tests with plugs and prussian blue.

(Incidentally, a plunger will expand from .005" to .006" when heated to casting temperature).

I selected 2.0625″ as a standard oversize, because it was large enough to cover any well, and because I finally had to buy a second solid reamer for a finish reamer, and this was available size 2 1/16″. I ordered a dozen plungers size 2.060″, and went out into the field and began to rebuild pots on the machines.

For some years I think I had the only adequate reaming equipment in the country for field work, but now Bill Gordon in Minneapolis has done the same thing. His reaming equipment is perhaps not quite as efficient as mine, but his guide is better. And no doubt there are others over the country by now.

Since that first experiment I have reamed upward of a hundred wells, and have come to these conclusions:

As good a job as a factory boring job can and should be done by a skilled man with the proper equipment – but it is not a job for an inexperienced man with *any* kind of equipment. Any machine-shop man will tell you that reamers are the hardest tools in the shop to use.

When properly done, this job is satisfactory in every way. Tbe bigger plunger seems to give a slightly better capacity for a good face. It must be drilled in the bottom to get a proper stroke as explained before. The moutbpiece must be in good condition as outlined in Chapter XIX *Mouthpiece and Lockup,* page 173. (With all these factors in good shape, I have done some experimenting toward casting display faces, and have secured astonishing results on gothic bold type as big as 36-point.)

If an itinerant machinist comes through your town and wants to do a fast hit-and-run job, be sure of these items:

Any manner of installing a plunger a few thousandths oversize is not worth the time spent on it. The plunger should be at least .040″ oversize. This practically eliminates light reamers, because as a rule a light reamer will not go that deep without trouble.

It takes two different reamers to get a round hole; otherwise your hole will be hexagonal or octagonal and .005″ or .006″ larger than it should be.

The reamers for this work should be massive. The shafts at the very least should be 1″ in diameter, and the construction of the reamer itself as beavy as can be gotten into the space available. If there is any doubt, take the proffered oversize plunger to your garage and get it miked. A .005″ oversize plunger could easily be marked .060″ oversize.

A strong and firm guide, attached to the pot itself, is necessary. Otherwise you will wind up with a hole more egg-shaped than before.

A reaming job should always be accompanied by tbe installation of a new mouthpiece and a thorough adjustment of lockup and all parts connected with the pot. Be sure the pot spring and the plunger spring are in good shape.

What to Do About a Plunger That Is Too Big

This occasionally follows a pot-reaming job, but not very often. (Cast iron is not consistent in its expansion.) If the plunger is tight, first try emery cloth on it, all the way around, a couple of times. If the plunger is still tight – generally evidenced by coming out hard even though you clean it every day; sometimes by sticking during the day – put the rod in a vise, with the plunger snug against the vise-jaws. Take a 10″ or 12″ mill bastard file and go around the plunger with a crowning or rounding motion. You can cover an arc of about ½″ at a time, top to bottom of the plunger, then move to the next section. It is fairly easy to take off .002″ this way, and you don't want more than that, so go easy. You can tell where you have filed by the different appearance of the surface.

Metal Conversion in Customer's Plant

QUESTION: We wish you would give us the formula for converting stereo metal into Linotype metal. A man and his wife came through here on two different occasions and made a lot of this metal and it was okay, but we did not get their formula. It seemed to be a very simple matter. They just skimmed off the foreign matter and put a certain amount of the solution to each pot of metal. – W.H., Humboldt, Tenn.

LOOMIS: Linotype metal is approximately 4% tin, 12% antimony, 84% lead. Stereotype metal is approximately 6% tin, 14% antimony, 80% lead. (Many plants today, however, use the Linotype formula for stereotype and Monotype also.) Antimony makes the alloy harder and requires more tin to fuse the lead and antimony, but this excess lead and antimony is prone to form slag in a Linotype throat and is unsatisfactory to use.

Only refiners with expensive facilities can produce metal with proper content. If tin is required it is easily added in the plant, but if copper, zinc, arsenic, or other elements that encourage slagging, are present, you cannot get them out.

Foundry type contains too much copper for linecasting machines; zinc cuts are bad contaminators.

Tin vaporizes when hot, and is always skimmed off with the dross, and must be replaced to maintain about 3½% to 4%.

Dirt in metal creates a brittle, non-adhesive tendency sometimes along the slug face. Clean metal is important.

Periodic analysis warns you before your metal loses too much tin. The analysis is free, and the metal companies have a "plus plan" to keep your metal up to par.

HARDING: Zinc, copper, arsenic, iron, brass, and aluminum especially should be kept from the metal pot. Such materials can easily get into metal in the chips from a saw.

Tin is the most costly ingredient; it adds body, toughness, and fluidity, and produces a sharp face. Antimony imparts hardness and adds fluidity; it also expands at the point of solidification, though it shrinks as it cools.

Metal contaminated with zinc will leave a cloudy appearance on the surface of skimmed metal. It can be partly removed by shutting off the heat and skimming as the metal starts to solidify. Clean metal has a cobwebby appearance after skimming. Excess antimony will form hard dross in the throat.

Send ten ounces of metal to one of the big companies and tell them how much metal is in your plant. They will give you an estimate on toning metal.

How to Determine Impurities in Metal

QUESTION: How do you determine when metal contains too many impurities? — B.G.E., Eufaula, Ala.

By GEORGE ORTLEB in *The Printing Industry:* After stirring and skimming, good metal should be perfectly clear on top and gradually assume a cobwebby look. If it does not do this, you probably have appreciable contamination. If it looks vivid purple, dark blue, or reddish at 600°, one of the impurities will be zinc, which, even in small amounts, makes type metal "mushy" and unsuitable for use.

Flux

QUESTION: What kind of flux do you recommend?

HARRY G. POTTLE in *The Printing Industry:* Easy use of so-called metal fluxes is dubious. So are home methods of removing impurities from metal. The old-time method of throwing a piece of tallow into the pot seems to help, but this may leave oil in the metal, which may reach the mats. Try another oldtimer; put a big Irish potato on the end of a steel rod and stick it down in the bottom. It will bubble and agitate the metal, helping to clean it mechanically. It is doubtful that anyone but a metallurgist can properly use any agent that causes a *chemical* change in the metal. The Monomelt method of using a paddle to rub out the dross seems as good as any.

Pigging Metal is Important

Metal does not undergo as much deterioration in the linecasting machine pot as it does in the remelting furnace, where the temperature is allowed to go pretty high. Use a smelter that will hold 500 to 1000 pounds. Cover it. Don't melt too rapidly. Take 1½ hours to bring 1,000 pounds of metal to 600-650° F. Use a thermometer. Agitate the metal, stirring from the bottom of the pot, and scrape the pot. The oldtimers stuck a potato on the end of a steel rod and stuck it in the metal for agitation, as noted above.

Flux can be used. Tallow has been used and is efficient, but may leave oil in the metal to get on the mats. When the metal reaches the right temperature, stir, flux, separate the dross to a black powder. Skim the metal. Use a dished skimmer at least 4" in diameter with ¼" perforations. Put the black powder in a drum that your metal house will furnish without charge. A 500-pound drum of dross and a sample of your metal will bring you 250 pounds of "plus" metal properly compounded. (In sending samples, the trimmings from under the machine are good.)

After skimming, reduce heat and pour as rapidly as possible.

It is common sense to avoid breathing the dust, although actual cases of lead poisoning are very few.

IMPERIAL TYPE METAL COMPANY (in the booklet, *Type Metal Alloys):*

DO NOT: overheat your metal; allow zinc, brass or copper to get into it; attempt toning without analysis; agitate metal unnecessarily; melt less than capacity of pot.

DO: skim metal at proper temperature; use flux; have analysis made periodically; stir molten metal thoroughly; use thermometer; add plus metal regularly.

Which Is the Best Metal?

LOOMIS: It is significant that questions about metal ranked second in frequency to questions about proper speed of an operator, back in the nineties.

In 1899 a reader of *The Inland Printer* asked: "Which is the best metal?" Metal formulas at that time ranged from 70% lead, 10% tin, and 14% antimony, to 100 pounds lead, 8 pounds tin, and 12 pounds antimony, and the price ranged up to 6 cents a pound, according to the formula (lead being far the cheapest ingredient).

"Expert" prudently refrained from sticking his neck out, and in June, 1899, thoughtfully remarked: "It is our opinion that the composition of linotype metal is not as thoroughly understood as it should be." A little later John S. Thompson said, "Poor metal doesn't plug up holes" (presumably mouthpiece holes).

This is by way of noting that there always has been disagreement about linecasting metal, and, as far as I am concerned, there still is. I am about to stick my neck out.

I have long been extremely dubious about the customary beliefs in the all-importance of metal. At one time or another almost every machinist has said that a casting trouble on a certain machine was due to poor metal, and has gone through the process of sending in samples for analysis, and so on. But as I look back over thirty years of repairing machines — and believe me, many of them have been in small plants far from even a railroad, where they never heard of

"keeping up" the metal and where anything from tobacco to old shoes has gone into it – in these thirty years I have never worked on a macbine in which I could definitely pin the trouble on metal.

This was brought home to me graphically in a two-machine plant in South Dakota. The machines were old and run down, and, from a machinist's standpoint, conditions were atrocious. This applied to the handling of the metal also. The strange part was that they had every kind of trouble but casting trouble. I assumed that by some miracle their metal had maintained its theoretical proportions, though I could not see how. Nevertheless, the slug was solid and the face was good enough for anything in the line of ordinary printing. As a matter of routine, however, I sent off a sample for analysis. About two weeks later the manufacturer sent me a copy of the report. The tin content was down to 2.15%!

I did a lot of careful thinking over that – and since that time I have never told a man, "The trouble must be with your metal." And strangely enough, I have not, as far as I know, left any unsolved casting problems behind me.

This is not to deprecate the conventional views or the exhaustive efforts of the big metal companies to find out more about metal, for they have spent a great deal of money to improve it. But the truth is that they themselves freely say that the composition of metal, or its exact proportion of tin and lead and antimony, is not the whole answer. I know that Imperial for one has made expensive crystallographic and spectrographic studies of linotype metal (and I imagine Federal and many others have too), and they are sincerely trying to get to the bottom of the problem. Imperial, for instance, went to great expense to make a large batch of chemically pure metal, only to find out it would not work in linecasting machines. They discovered that although arsenic above a certain very small percentage caused trouble, no arsenic at all caused more trouble! The only definite conclusion I can see is that linecasting metal, like a great many other scientific and industrial problems, is still a question.

Nevertheless, this does not mean that I throw the metal-care principles out of the window. It merely means that I have not, for many years, said, "It must be the fault of your metal." I have always, so far, been able to find some other reason for casting trouble.

I firmly urge – and practice – common sense principles in the care of metal. Don't contaminate it. Remelt properly, without getting above 650° F. Use some plus metal if the manufacturer recommends it, but if you have real casting trouble, don't expect a batch of new metal to fix it.

CHAPTER XVIII

BACK SQUIRTS

How Can I Eliminate Back Squirts?

QUESTION: How can I eliminate back squirts on a linecasting machine? The lockup seems perfect, and I believe the metal is at proper temperature. Would it be possible that the mouthpiece is warped? — C.J.R.

Poor Lockup Most Common Cause

HARDING: Poor lockup is the most common cause of back squirts. If the mouthpiece is warped, this will show in a proper lockup. (See *To Test the Lockup,* page 177.)

Hot Metal or Mouthpiece

LOOMIS: The second most common cause of back squirts. Keep the metal under 550° F. (See *Temperature of the Metal,* page 146.) Metal in country plants often runs above 600°, and metal at this heat does not solidify properly at the cast.

Metal on Back of Mold

LOOMIS: This also is a very common cause. Many country shops operate with no back mold wiper at all, and the molds accumulate a heavy layer of metal. Pull out the disk and look. If there is metal on the mold, take it off with a brass rule and mold polish. Also see *What to Use on Back Mold Wiper,* page 142.

Cold Metal or Mouthpiece

HARDING: Cold metal also will cause squirts. The pot can be tested with a sheet of folded newsprint. Hold it in the metal while you count three slowly; the paper should be a light brownish tint. To test the mouthpiece, which is supposed to be 490°, hold the smooth side of a slug tightly against it; it should start to melt in one minute. Or crowd a long metal sprue into a mouthpiece hole; it should melt in ten to twenty seconds.

Sometimes this trouble happens when the operator has turned the mouth-

piece low to set big slugs and forgotten to turn it back; sometimes it comes from drafts.

Metol Pot Too Full

HARDING: If the pot is too full, metal will drip from the mouthpiece as the pot rocks forward and prevent a clean lockup.

Dirty Plunger or Well

HARDING: If the plunger becomes dirty enough to stick momentarily, it will rise as the pot goes forward, raising the plunger roll off the cam. Then the plunger gives way, and the short drop forces metal out of the mouthpiece before the lockup. This solidifies and causes a squirt on the real cast.

Tight Plunger or Dross Ring

HARDING: A tight plunger will do the same. Rub tallow or metal flux on it occasionally. If a dross ring has formed, scrape it out as told in *Dross Ring in Well,* page 157.

Plunger with o Short Stroke

HARDING: A plunger will work better on bigger slugs if it has a longer drop. A plunger that drops well down into the well has better suction when lifted, and tends to pull the metal back into the throat away from the mouthpiece.

A plunger with a short, spongy stroke may cause back squirts.

Weok or Broken Pot Spring

LOOMIS: Occasionally a pot lever spring will lose its compushency; if no other defect shows up, it does not hurt to try a new spring; they're inexpensive. Also it is surprising how often, when you are doing this, the old spring will fall apart once you get it out of the machine. I spent two hours once cleaning squirts out of a machine where everything was perfect, only to find that the pot spring was cracked on the side I couldn't see.

Worn Vise Shoft

HARDING: Only recently has provision been made for oiling the pot leg bushings. It has always been advisable to oil them, however. The friction may seem little, but it will wear both bushings and shaft enough to cause a squirt. In such a case, get a vise shaft and bushings. In an emergency, you can push the shaft one inch to one side and get new bearing surface.

Excessive Recasting

HARDING: Any machine will tend to squirt on recasting big slugs, for the greater quantity of metal carries much more heat to the mold. Do not cast over three 12-point, 30-pica slugs per minute unless you have a mold-cooling device. When the mold gets too hot, the metal will run back out of the slug when the mouthpiece pulls away, and the next cast may be a squirt.

LOOMIS: Watch a gas mouthpiece. It should not be necessary to run the flame over an inch high at the most. If you let it run away it will often overheat the mouthpiece and produce squirts.

Pot Leg Adjusting Screw or Pot Leg Cop Screw Loose or Pot Leg Cop Broken

HARDING: One of the four adjusting screws or one of the two cap screws may work loose. Loosen the nuts one at a time to try all the screws. Turn the screws up snug but not hard, or you'll be sorry. The pot leg castings are comparatively weak.

Pot Com Roller Beoring Broken or Pot Leg Bushing Crocked or Broken

HARDING: Either of these causes will produce squirts.

Pump Stop Brocket Set Too High

When the pump cam wears and allows the plunger to rest low enough to shut off the holes in the sides of the well, an oversize cam roll should be applied. This may cause the pump lever lug to be poised too far above the pump stop lever. Then when a loose line is sent in, the pump lever will make about an eighth-inch stroke. This will push a little metal into the mold, and this will cause a squirt when the next line is sent in. Slot the holes in the pump stop bracket and raise it until there is barely clearance. Adjust the stop.

Pot Lever Rubs on o Com

The pot lever must be adjusted laterally to cause it to run free of the three adjacent cams. A pot lever that has contact with a cam at the time of the cast will cause a squirt.

"After"-Squirts

HARDING: Sometimes metal drops from the mouthpiece as it backs away from the mold after the cast. When the pot locks up the next time there will be a squirt. After-squirts are caused by dirty plunger, tight plunger, short stroke of the plunger, metal pot too full, pot balance spring too stiff.

When the stroke of the plunger is short, there may still be a little down pressure on the pump as the metal pot backs away.

Lug on Crucible Broken
Loose Tie Rod

HARDING: W. M. Gage of Hillsboro, Ill., found one of the lugs on the crucible broken. He also points out that a loose tie-rod can cause a poor lockup. The tie-rod passes through the right-hand cam shaft bracket and is threaded into the center column. It should be set with little more than finger pressure.

Screws Left out of Pot Top

LOOMIS: I discovered that one screw omitted from the front of the pot top allowed the crucible to work up and finally to squirt consistently. If you have to omit a screw, omit it at the back.

Shollow Cross Vents

HARDING: H. H. Canfield of Watertown, N. Y. writes that shallow cross vents will contribute to squirts when changing from long to short measure.

Cross Vents Hove Too Big on Opening ot Bottom

LOOMIS: If the vents allow a sprue more than about ¾" long when the mold is cool, you may get a squirt from excessive drip. See *Venting the Mouthpiece,* page 178.

High Spot in Throot

HARDING: A contributor to *The Graphic Arts Monthly* says that he has found a high spot in the throat just inside the mouthpiece that apparently caused squirts.

LOOMIS: This is hard to understand. It certainly could cause a bad spot in the face of the slug, but as to squirts — well, I've seen some unbelievable things on linecasting machines. The contributor probably is right.

Loose Vise Locking Screw or Stud

HARDING: Harry C. Baller of Los Angeles suggests that a vise locking screw or stud may be loose, especially the right-hand, and cause squirts (this does not refer to mold disk locking studs).

Foulty Electricol Controls

HARDING: A faulty governor or electric thermostat may allow temperature variations that will cause squirts. A faulty rheostat may cause squirts.

Mouthpiece Does Not Lock up at Lower Edge

LOOMIS: I have put on a great many mouthpieces, and it has been my observation that a couple of years later they will show warp and will need honing – not too much but some. It also is true that invariably such a mouthpiece will be light on the bottom, and ragged as if there were tiny holes punched in it. This rather seems to come from the tiny amounts of metal that accumulate on the bottom edge of the mold and are there during lockup – not enough to cause a squirt, but enough to beat the mouthpiece in a little. Remedy: hone the entire mouthpiece until the bottom is at least fair.

HARDING: This is a common trouble on old machines. Look first to the mold posts to see that they are not sprung. Then check to make sure that the mouthpiece adjacent to the cross vents, was not swollen by the use of a chisel when venting. The red lead transfer will show this. See that the metal pot does not rest too far back on the vise frame shaft. This would require that it rock too far forward before making contact with the mold. The mouthpiece would be carried past perpendicular before contacting the mold.

All too often it is found that a novice, dressing the mouthpiece with a file, has taken off too much from the lower edge.

Sprung Mold Posts

LOOMIS: Very often you will, on testing with red lead, find a mold that tests fine on the upper half but not at all on the lower half. This is likely due to sprung mold posts. For some reason they always seem to bend backward. It is therefore imperative that you check the mold before honing. This is easy. Put in a liner – preferably a good liner – and pull out the mold slide and look at the back of the mold. Both base and cap of the mold should be flush with the liner. If one protrudes, it usually indicates bent posts. The best way to straighten them is to take off the mold, knock the pin out of the post, lay the post on a steel surface, and hammer it straight. Test as before, with the liner. Get both ends right. You may find the post broken. You can operate without it, but send for a new one and a new pin.

HARDING: Run a straight-edge over the face of the mold to determine the extent of the trouble. If more than one or two thousandths of an inch, the small pins should be driven from the mold posts and new posts applied. The posts may possibly be straightened but this is work to be undertaken by a competent machinist.

Mold posts *may* be straightened in a vise. Protect the jaws of the vise with brass. If the posts are sprung forward, put an extra one-point brass rule in front of the cap and one behind the body and squeeze the mold. Work carefully. Test often.

Warped Disk and Mold

LOOMIS: After considerable thought I have concluded that I have never seen a mold warped badly enough to cause squirts. I know that the mold cap of a recess mold will warp and cause trouble on ejection, and I have seen a mold base knocked out of square by repeated hammering with the ejector, but I am slow to say a warped mold causes squirts.

I brighten considerably, however, when you mention warped mold disks. Most disks are warped, especially on gas machines, and some so badly that you cannot make a mold lock up without using shims. For more on warped disks, see page 127 and page 214.

Molds Ground Down

LOOMIS: Much more serious is the continued use of mold polish on the back mold wiper. After advocating oil and mold polish for many years, I had it proved conclusively to me that mold polish does contain an abrasive. It is very mild, to be sure, but continued every-day use on a back wiper will scour out a path in the back of a mold. The one I saw, when we finally got it off, had been ground down about .015"!

I use mold polish; you can't get along without it — but not on the back wiper.

Excessive Tin; Pot Lever out of Adjustment; Jet Marks on Slug Run Over Edge

The Imperial Metal Company in their excellent booklet points out these three additional causes of back squirts.

Machine Back Squirts When Changed to Short Measure

QUESTION in *The Graphic Arts Monthly:* This machine switches from news to the 14- and 18-point and the 8-point on 30 picas, a great number of times each day. When swinging back to straight matter, the mouthpiece has to be wiped off each time or it will back squirt. Can I expect this machine to change back and forth without trouble? — M.L.M., Lafayette, Ind.

HARDINGS You have caught me with an old question that is presented frequently, and with which, I must confess, I have had little experience. I have often wondered why, and my only explanation is that I always have been careful to keep the lockup good and temperature under control, and therein, according to the authorities, lies the answer. It is true, however, that there are obscure causes that sometimes baffle us. One of the most common causes of this particular trouble is faulty liners.

LOOMIS: The lockup should be checked, for it is possible, as we have said before, for a poor lockup to operate all right on thirty picas but cause trouble on short measure.

However, I agree with Harding that the most common cause is faulty liners. They may be either bent or shaved down. A liner hit with an ejector blade should not be used at all unless you file around the slot and the guide-piece until the liner goes in straight and fits down flush with the mold. With careful filing, that can be done, but it is good practice to order a new liner. Liners get shaved off on the back side of the mold disk because they are tamped in too hard with the screwdriver, and then the back knife, which may be set tight anyway, trims them down. I have found that any liner that measures under .873″ at the casting end should be discarded. If you do not have a micrometer, put the liner carefully in the mold and see that it is flush with the mold on the outside. Then pull out the disk and examine. If your fingernail detects more than a perceptible difference in height between the liner and the back of the mold, it may well be too low. A new liner measures .875″; some measure .876″ to allow for wear.

A sure way to tell if your liner is undersize: put in a new liner carefully and try it. If it works all right, then it is safe to toss the old liner in the junk-pile.

Cleaning up a Back Squirt

HARDING: Open the vise, pull out the mold disk, and dig out the metal, using with caution the pot well hook, an old screwdriver blade for prying, and a hammer for places where it is absolutely necessary. Do not touch the molds or back knife with anything harder than brass.

With a little practice you will get so a little tapping and a little prying will loosen the worst-looking squirt there is. Turn the disk all the way around and watch inside the flanges; sometimes it will be up under the back knife; sometimes it will be around the ejector guard. The old ejector guards are easily removed by the two screws on the right side.

Get all metal out and see that the disk turns freely.

LOOMIS: I strongly advise against removing a mold to clean up a squirt. In fact, *I do not countenance removing a mold for anything* but necessary repair work or to shim it up to meet the knives. A squirt can be cleaned up without taking off a mold.

If you have a dummy mold on the disk, it will sometimes facilitate metal removal, especially from under the back knife, to take out the dummy—but not a mold. Take off the back knife rather than a mold.

CHAPTER XIX

MOUTHPIECE AND LOCKUP

What Is the Occasian for Taking off a Mauthpiece?

QUESTION: I have heard machinists talk of taking off a mouthpiece, but I've never seen it done. What makes it necessary? — P.H., Riceville, Ia.

LOOMIS: Your life is still ahead of you. You've never really lived until you've taken off a mouthpiece.

When a mouthpiece has been honed so much you can't get a lockup, or so much that the vents are too shallow to cast a good slug, or if the vents have been opened so much on the bottom that you get back squirts, you will need a new mouthpiece. Sometimes putting on a heavier pot spring will start a mouthpiece to leaking and you cannot stop it without removing it. Rest easy. Your time will come soon enough.

How to Remave a Wedge Mauthpiece

QUESTION in *The Graphic Arts Monthly:* I would like to learn how to remove a mouthpiece that has been on a Linotype for fifteen years. I have religiously followed the method recommended by Mergenthaler, but always find four to seven screws that must be drilled out. Is it practical to perform this job on a cold crucible? — L.P., Norton, Kan.

LOOMIS: The neatest answer I've ever seen to this question was given in *The Inland Printer* for April, 1898: "Get a mouthpiece extractor from the Linotype Company." (Of course Mr. Lincoln didn't mean it the way it sounds; he undoubtedly meant, "Get a drift and go to work.") In the absence of the extractor, however, listen to

HARDING: This job should not be attempted unless a new mouthpiece and gib are at hand, because one or both parts may be ruined. Procure a drift. This tool is different for Linotype and Intertype.

Have the heat on. Loosen the front pot leg adjusting screws and the pot leg cap screws. Remove the shield from above the mold disk and note that its right side slips under a screw head. Open the vise, pull out the disk; remove the left-hand vise locking stud. Wedge a piece of hardwood between the end of the mouthpiece and the mold slide. Place the drift on the left end of the mouth-

piece and with a three-pound hammer drive the mouthpiece hard to the right, using blows that "follow through."

The tang of a file can be held between the lug on the mouthpiece gib and the crucible by an assistant to prevent the gib from sliding with the mouthpiece.

If the mouthpiece refuses to loosen with three or four blows, the left end will start to burr. If you swell the end of the mouthpiece very much, you cannot then drive it on through, for the swollen end will break the lips of the crucible. You will lose your seating for the drift, and will then have to saw the mouthpiece almost through from end to end until you can drive the two halves together and loosen the mouthpiece. Don't saw into the crucible.

LOOMIS: I like first to get a good slug from the machine — one that shows the end holes. Then I get around in front before I start hammering, and with a small file or a pin punch mark the position of the right-hand hole in the mouthpiece from the right end. This facilitates positioning the new mouthpiece, and by reference to the old slug you can move the new mouthpiece one way or the other if you wish.

I have discovered also in the last few years that penetrating oil is a great boon to the printing industry. Apply it half an hour before removing the mouthpiece, or, better yet, perhaps, the night before.

I prefer a linotype pig between the pot and the mold slide. I drill a hole through one end of the pig and put in a nail to prevent any possibility of its dropping through at the wrong time.

As to working the pot cold — I doubt it. I have experimented on a number of old pots, and the result always is the same: the hotter the pot, the easier the mouthpiece comes off.

To Remove a Screw-Type Mouthpiece

HARDING: The company makes a special tool for loosening the screws. Mark the position of the mouthpiece hole. Have the pot hot. Place the screw loosener in the screw slot and strike it a smart blow. Use a 6-inch screwdriver with a perfect blade. Be sure it fits the slot. You may use a Crescent wrench on the blade.

If the screw head breaks off or the screw cannot be loosened, you will have to drill it. Start with about a No. 45 drill that will go into the slot. Drill through the center. Follow with a No. 10 drill. Use plenty of oil on it. Use a ¼" drill and drill off the screw head. Remove the mouthpiece. Sometimes a small pipe wrench will extract the screw. Sometimes it will only tear it up. Use a No. 6 or No. 7 drill and drill through the center of the screw to the bottom. Clean out the hole with a ¼x24 tap. If the threads are ruined, tap the hole with a 16x24 tap and use an oversize 16x24 screw. Your branch office can supply these.

LOOMIS: Here again, penetrating oil is wonderful to loosen the screws. I have often had trouble with the screw loosener because it tends to swell the screw heads so they bind inside the counterbored hole in the mouthpiece.

If you drill the top screws on an electric pot, don't go through any farther than necessary. I once ruined a perfectly good mouthpiece heating element by drilling into it. You would have thought it was Fourth of July.

The m-o will seldom have a 16x24 tap and screws on hand. In that case, drill the hole with a size F or a 17/64″ drill and tap it for 5/16x18. Screws for this are available at any hardware. You will have to use some patience to grind down the head, both around the edge and on the top.

HARDING: Before starting the mouthpiece job, you should have secured also a throat saw. When you get the mouthpiece off, probe out the throat, especially the sides. Then fill the pot, take off the pump stop bracket, hold a pig-mold under the mouth of the crucible, and tip the pot forward to flush out the dross. Especially see that the lips of the crucible are free of all dross.

Grinding in a Wedge Mouthpiece

Scrape all oxides and metal from the crucible while it is hot. Lay the mouthpiece on a block of wood face down and drive small brads through the end holes. Lift off the mouthpiece and tap the brads in until their exposed length is less than the thickness of the mouthpiece. Put the mouthpiece back on the brads. Spread a mixture of valve grinding compound and oil evenly on the inside and upper surface of the mouthpiece. Hold the mouthpiece against the upper crucible lip, and, with short strokes, grind until the mouthpiece and crucible show bright their entire length. A good many applications of compound may be necessary.

LOOMIS: I have found many mouthpieces (wedge and screw) that were not flat to start with. Get a straight edge (your garage mechanic may have a Starrett or Lufkin or Brown & Sharpe 12″ rule, and they are usually pretty straight), lay it edge-on to the mouthpiece, and hold it up to the light. If you get the light in line with your eye and the crack, it will look like a big crack, but it isn't. See that it is the same width all the way across. This test can be accurate to within .001″ of an inch. If the mouthpiece is bowed, lay the two ends on Linotype slugs with the bow up. Tap very gently with a plastic or rawhide hammer. GENTLY. Those mouthpieces bend incredibly fast. If you get it straight to start with, your work will be about seventy-five per cent less.

Fitting a Screw-Type Mouthpiece

LOOMIS: The traditional way to put on this type is also to grind it in, but I think I have evolved a better system. I use a flat stone — the same hone I use on the mouthpiece itself, and work on the crucible until it shows bright all the

way around the opening. I usually pull out or cut off the two pins that position the mouthpiece on the bottom, and remove the splash guard. You can drill out the stubs of the pins later and put in new ones. Then straighten the mouthpiece as told in the paragraph above, and you will need very little or no grinding at all.

On an Intertype, hold down and against the crucible to grind in.

To Seal a Mouthpiece

HARDING: It may be applied without a seal. Some machinists use graphite and oil, others use red lead and glycerine. Loomis uses white mixing ink. But be sure to put oil and graphite on the screw threads. Set the mouthpiece in position as marked and bring all screws up to a bearing. Use a screwdriver with a perfect blade that fits the screws. Start at the center and work out, to right and left, until all screws are tight. It may take a dozen times around.

A wedge mouthpiece may be applied either without a seal or with the same mixtures. Set it in position, then drive the wedge in tightly. Red lead and glycerine will make it harder to drive off the next time. Red lead and glycerine are also hard to apply when the machine is hot.

Always use graphite and oil on the gibs.

LOOMIS: Lawrence Morris finally persuaded me to try it without a sealer. It works.

What to Do if Mouthpiece Location Is Lost

HARDING: The mouthpiece may be re-located by removing the mold cap, putting liners in the mold, putting the mold in casting position, and holding out the mold disk turning handle while you pull the clutch and let the machine turn over until the mold disk locking studs enter the blocks. Now you can pull the pot forward against the disk and see that the end holes come inside of the liners for 30 picas. At this point you can shift the mouthpiece either way if necessary, by tapping with lead pig and discretion.

Holes Must Be Properly Positioned on Bottom of Slug

LOOMIS: I hope you pulled the plunger pin on that last test. Now let's turn the machine on over, after removing the liners (which should, of course, have good full tips on them for that test), and let the machine come to normal. Put the mold cap back on and seat the mold properly. (See *How to Seat a Mold,* page 134.)

Use your 30-pica liners and cast a slug. Examine the base. The mouthpiece holes should show round and full all along the smooth side, and the end holes should show full — both of them. They probably won't be perfectly aligned

the first time. Use the top and bottom pot leg adjusting screws to raise or lower the pot a little until you get the holes just resting on the smooth side of the slug. Loosen the front screw on each leg. Loosen the bottom screw on each leg. Use the top screw on each leg for adjusting. Each time you adjust, turn back the front screws and the bottom screws with your fingers. When you get it set, tighten the lock nuts on the two top screws.

It is essential that both end holes get a full cast without interference from the liners. If one is partly covered, you can shift them some by moving the pot up or down on one end. For instance, suppose the right-hand hole is partly cut off. You can raise the right side of the pot a fraction and probably bring the hole in full without throwing the horizontal adjustment off too much. You have, of course, more leeway if you don't go below 8-point slugs. Machines vary, but you will find the middle holes will stand more interference than the end holes. (This is only for machines where for one reason or another you cannot move the mouthpiece enough to bring it into alignment.)

To Test the Lockup

HARDING: Daub the red lead on the back of the mold and push the disk back in casting position. Close the vise, raise the mold slide connecting lever, and connect the ejector blade. For safety, set the ejector for the shortest mold. Pull out the mold disk pinion and hold the disk so the studs will enter the blocks. The motor is off. Pull the controlling lever and have an assistant turn the cams until the metal pot locks against the back of the mold. Then back the cams till the mold disk retreats, open the vise, pull out the disk, and examine the lead now on the mouthpiece. There are times when this test is a little deceiving. Try this method of testing:

Clean mouthpiece and mold thoroughly; spread on the transfer compound; leave the mold in front of the mouthpiece, close the vise, and back the machine until the disk advances; use a pinch bar between pot lever and cam to pry the pot gently forward for the lockup test.

LOOMIS: Harding's test is a conventional test, but he warns you it may be deceiving, and he is right. I have seen a lot of different lockup tests, but I have stuck to one I learned from "Professor" Churchill at the New Orleans Mergenthaler School. You lower the first elevator to casting position; open the vise (it's a little easier if you drop it into the second position); turn the machine by hand until the pot lever roll is on the highest point of the short shoe; disconnect the mold slide.

Now have some red lead or litharge mixed into a paste form with oil. If you mix up a batch, the red lead will settle and the oil dries up. Squirt a little oil on it and rub it with the dauber made out of a part roll of 2″ gauze, wound tightly and tied in the middle until it is about ¾″ in diameter. Be sure the molds are clean. If you have not seated them yourself, or if they have never been seated by a professional machinist, this is a good time to do so. Take off

each mold; observe shims if any; clean molds and seats thoroughly and clean backs of molds. Replace each mold in its original place in the disk, with the same shims, and with the tighten 4 – tighten 3 – loosen 4 – tighten 4 – loosen 3 – tighten 3 ritual (see *Seating a Mold,* page 134).

Daub red lead on a mold with a spotting motion. Push the slide back against the mouthpiece with a little slam. Now open the slide and look at the mouthpiece. A perfect lockup will of course show solid color all the way around the holes, top and bottom and both ends. Often the ends won't show too well because the liners are shaved down.

Let's say the left end of the mouthpiece shows up light. Then the left end is too far from the mold. Loosen the bottom screw on the left pot leg. Turn the back screw on that leg out about half a turn. Turn the front screw up with your fingers. Turn the bottom screw up with your fingers. Try the test again.

Keep at it until the mouthpiece shows a full transfer top and bottom, and even from side to side.

On a pot leg with two screws front and back each, turn them up together.

When you're all through, tighten all lock nuts.

If one end in general shows heavier than the other, try adjusting the pot legs. If you get a fairly even impression all over but there is a hole in the middle, or if the mouthpiece shows high in the middle, try another mold. Occasionally but not often a mold will be defective. Not often, I said – just enough to make a check desirable. If the second mold shows up the same way, the mouthpiece needs honing. See *How to Hone a Mouthpiece,* page 181.

Some machinists use soot, but that is messy. Many like to turn the machine over under power, but this can be a fooler, as Harding suggests. Nemo Wraggett at the Minneapolis Star got good results by holding a piece of newsprint between mouthpiece and mold at lockup, but his machines were about as near mechanically perfect as a battery can be. For the man in the country, I like the red lead test. It never has let me down but once; there is a certain machine in Minnesota that has been worked over by at least five machinists, including me, and it has had everything replaced but the pot itself, and it will still squirt on a change-over from 30 picas to 20 picas.

One thing to remember about a poor lockup: it is entirely possible for a lockup to give good results on long slugs but squirts on short slugs; this will look like a bad-liner squirt, but it isn't always.

Venting the Mouthpiece

LOOMIS: There is quite a bit of confusion in terminology about venting the mouthpiece. There are two operations spoken of in connection with the vents. One is cutting the vents deeper; the other is opening the bottom ends of

the vents. My conclusion is that it is next to impossible to cut the vents deeper, though this is spoken of in many books on mechanism. What is commonly referred to as "venting" means making a slight opening at the bottom of the vent (or cross vent — they mean the same thing) for the air to escape, and that is the way I shall use the word.

Cast twenty-five slugs to warm it up. Then stop the machine immediately after the pot breaks away. With an extension light look behind the disk. You will now see the sprues you are getting. On a new mouthpiece you may not see any. (The sprue is the slender squirt of metal that drops out of the cross-vent at the cast.) Now you will have to "vent" the mouthpiece. As I said above, this is an inaccurate term, for the mouthpiece was vented when the half-moon-shaped cross-vents were milled in it. But "venting," as I use it, is necessary for a good slug.

Gas pots require more sprue than electric pots. The ideal is a sprue 3/4" in length, but electric pots frequently run well on 1/4". At any rate, be slow to vent. If it is a gas pot, cast at least twenty-five slugs before you start venting, for as the mold gets hotter the sprue will get longer. On a gas pot with a new mouthpiece I aim at a sprue about 3/8" to 1/2" long, because you will often find another 1/4" will develop after a week's use. Therefore, don't be in too big a hurry to get the full 3/4".

Now lower the vise, pull out the disk. Get a sharp pocket-knife and a small 4-ounce hammer. Stand at one side. Hold the blade of the knife at the bottom of the cross-vent and tap it once, gently, with the 4 ounce hammer. Go all the way across like this. Cast a dozen more slugs and then look again. This time some sprues will be pretty full, but some won't show. Count the ones that need a little more. Write down the numbers, starting from the right. Open up the machine and give those numbers a little tap.

When I say "a little tap," that is exactly what I mean — a tiny tap. Some mouthpieces are astonishingly soft. Now try it again. If they don't all show up as they should, forget it for the time being. Run it a week and then look again. This venting is a tricky business. In my early days I vented a few pots, staying with it until I had 3/4" sprues all the way across, but later I was amazed to discover that my carefully vented mouthpieces ejected about a pound of metal at each cast. It was very embarrassing — but that's the way pots are. The amount of venting actually necessary is very little. You can hardly see it. When you are through, take the smooth side of your perfect oil stone and make a couple of passes to eliminate the tiny swellings thrown up by the knife blade.

What to Do When You Get the Vents Too Big at the Bottom

Loomis: Ordinarily they can be closed a little by tapping the knife blade into the mouthpiece a little to each side of the cut, on the edge, and thus swelling the sides of the cut together. Center punches have been used, and even a

ball pein hammer from underneath. But this is messy business at best, and probably will mean another new mouthpiece before too long, because, as I said, the sprues will grow. So be very cautious in your first venting.

Also, to reassure you, it is well to note that occasionally you get a mouthpiece that is brittle, and when you try to close the vent you only flake off chunks of cast iron. This is not only embarrassing; it is humiliating.

In spite of all my experience, I vented too much on my Model 15 a year ago. With a new mouthpiece, electric pot, I ran it several days. There were no sprues. I vented with extreme care, for this would be one mouthpiece that was perfect — just a very light tap against a knife blade with a 4-ounce hammer. A week later I was hiding my head. The sprues were three inches long. The only explanation I know is that the mouthpiece was unusually soft. I had to butcher it — use a prick punch at each of the vents, sometimes peen up from below. Since then I have talked to Milt Anderson, who tells me he usually does this job that shouldn't be needed by using the knife blade at either side of the vents, on the corner of the mouthpiece, swelling the metal over to close up the vent. This sounds like a neater and more nearly certain way to repair a bungled job.

Shallow Cross Vents

LOOMIS: It is true that the cross vents must be vented or you will have trouble getting a good face on large type. It is also true that the cross vents themselves — the half-moons — must be deep enough and long enough. A proper vent should be just about two picas from top to bottom. I can't give you a figure on the depth, because it would take a special instrument to measure the depth, but I have always assumed the vents are made by milling cutters, and if they are long enough they should be deep enough. (Offhand, I'd say about 1/16" at the deepest place). The top of the vent should be about a pica above the hole in the mouthpiece, and the bottom of the vent just about reaches the bottom edge of the mouthpiece. It is well to examine a new mouthpiece when you get it. I say again that I seriously doubt that a machinist can materially deepen or enlarge the vents themselves. I once installed a new one that had shallow vents, and could not get a good face on the 14-point bold. That's what makes a machinist's life so fascinating — the unexpected.

Cleaning out the Vents and the Holes

LOOMIS: It is common practice in the Northwest to scrape out the vents and the holes. Some use a discarded spaceband. Some grind the end of a file to fit the vent. Some buy a special "venting" tool and scrape upward with the tool fulcrummed against the dummy mold slot.

This is heresy, but I am about to disagree again. I have run two separate batteries of machines and quite a number of single machines in the last thirty years, and I am almost ashamed to say that I have never scraped a vent. I merely

wipe the mouthpiece with a cloth every day. And so far there have been no ill effects.

The same goes for the mouthpiece holes. It is a wide-spread practice, not confined to this area, to poke the holes out every day, and at least once a month or once a year to drill them out on general principles. I see no need whatever for this unless you are having trouble. I never do it, and so far I have not had that kind of trouble. The real trouble in mouthpiece comes from behind and not in front.

How to Stop a Leak in a Mouthpiece

Loomis: No matter how carefully you put on a mouthpiece, it may leak a little. Each time you open up the vise, during your lockup test, inspect the mouthpiece for leaks. You may find two or three small ones, where a pinhead of metal oozes out. These you can ignore for a few days. They will usually seal themselves by corrosion. If they don't, they'll get bigger. Let's say they're a little bigger than you like, either at the ends, top or bottom, or at the screw heads. Don't be too quick to jerk off the mouthpiece. Get a nickel's worth of epsom salts and mix it with an equal amount of table salt. Dissolve all you can in a small glass of water. Get a small oil can and fill it full of the saturated solution. (You can get soda straws; dip them in the solution and hold your finger over the open end; then you can apply the solution — but an oil can is more efficient, though it will corrode in a few days and be useless.) Wipe all metal off of the place where it oozes out, and dribble your solution on the place until you build up a white, hard film.

The heat of the mouthpiece will harden the stuff almost immediately. Try casting again. Be patient. You may have to spend an hour at it, but you can generally stop small ones this way. And if you can stop them for a little while, they will seal themselves — with corrosion, I suppose.

Harding especially recommends a saturated solution of zinc and hydrochloric acid — soldering fluid. Drop particles of pure zinc in one ounce of the acid until no more will be dissolved. Use a glass tube or medicine dropper to apply several coats while the mouthpiece is hot, and allow to stand, preferably overnight. I've never tried this, but it sounds reasonable.

Harding lists also rubber stamp compound, equal parts of lye and salt mixed with water and applied to a cold pot; chloride of lime and cold water applied hot.

How to Hone a Mouthpiece

Loomis: If a mouthpiece shows consistently light on the right end, for about the width of the straight-matter slug, it is well to be suspicious of the mold. A mold that sees long service will sometimes be worn down on that end.

Check it against another mold if you have one. Or take off the one mold and hold it up to the light (after cleaning) and try a straight-edge on it. Sometimes you can see the low area.

But let's say you have an old mouthpiece that needs to be trued up. I've heard of machinists who could do this with a file, and I've known some pretty good file artists, but I tried this a number of times and gave it up. It was too much work to hone out the file marks.

This is my method: get a No. 109 Carborundum stone. This is 1x2x6", with one side fine and one medium. (India stones are good but cut much more slowly.) Now hold the stone up to the light and try your straight-edge on it. About one stone out of four is crooked — some as much as 1/32" — and you cannot get a flat mouthpiece without a flat stone.

Open the mold slide. Have a number of rags handy, folded up to use as pads. Have a can of cutting or threading oil to use on the stone. Wipe the metal from the mouthpiece. Standing at the side, squirt plenty of oil on the stone and then lay the stone flat on the mouthpiece. You can feel it when it is flat. Now go back and forth, short strokes. After twenty-five or thirty strokes, stop and look it over. You can tell from the mouthpiece where you are hitting and how far you have to go. Ordinarily about fifteen or twenty minutes will take care of a mouthpiece. Sometimes they require a couple of hours, but the difficulty then is that you will have taken off so much metal that you have reduced the depth of the cross vents.

The main thing in honing is to keep the stone flat on the mouthpiece. When the mouthpiece begins to look flat, try the red lead. You may have to adjust the pot legs.

Mouthpiece Does Not Lock up at Lower Edge

LOOMIS: We discussed this above on page 170, but there is another angle to be brought out. On old mouthpieces, sometimes the bottom edge just seems to be too far back. The mold posts are okay, the mold itself is good and the two parts of the mold are in line, and the mouthpiece seems to be flat when tried with a flat stone.

In this case, bring the pot legs forward as far as they will come. I don't know why, but perhaps the crucible itself is "bent in" a little from thousands of lockups. Ordinarily you can get a good lockup by bringing the legs forward, but sometimes you cannot. In these cases I have had to hone the mouthpiece at a new angle, taking most off the top and almost none from the bottom, until a lockup could be secured. I do not use a file.

How to Drill out Mouthpiece Holes

HARDING: If a little dross collects behind the mouthpiece, you may be

forced to drill out some holes. This is especially true on a mouthpiece that has been used on short measure only for a long time, and which now you want to use on long measure. Use a 1/16" or No. 52 drill; use threading oil or grease graphite on it, and drill slowly and cautiously. Don't use too much pressure.

If you do break off a drill and cannot get hold of it to pull it out, take a small punch and tap it on through, leaving it in the throat until the next time the mouthpiece is off.

Should You Enlorge Mouthpiece Holes?

HARDING: Sometimes, in the hope of producing a more solid slug, the mouthpiece holes are enlarged by using a No. 51 drill or even larger. But this is a matter for an experienced machinist to decide. Larger holes sometimes produce complications in the form of back squirts.

Sometimes o Perfect Mouthpiece Won't Work

LOOMIS: Once in a while — usually on a single-mold machine — a strange situation occurs. The machinist either hones the old mouthpiece to perfection, or puts on a new mouthpiece, only to find that he cannot get a lockup because the mold itself is an oldtimer and badly worn. In the course of millions of lockups, the mouthpiece has shaped itself to fit an untrue mold, and they have worked well together, but the new mouthpiece refuses to co-operate. If you suspect this, first be sure your hone is perfect, by testing it with a straight-edge; then take off the mold and check it against the straight-edge. On a very old mold you may find some astonishing conditions.

In such a case the only real remedy is to get a new mold. Some owners have had their molds ground down to flatness, but this necessarily reduces the height of the slug, which is not convenient, to say the least.

Cold Foce Coused by Throot Clogged

HARDING: The symptoms of a clogged crucible are a pitted, ragged face. The condition develops gradually. It calls for removal of the mouthpiece and cleaning out the throat with a throat saw.

It is believed that metal in poor condition has a great deal to do with this trouble. An excess of antimony may produce dross in the throat, and of course zinc, copper or arsenic above very low limits will give trouble.

LOOMIS: Within my experience, dross in the throat (which usually turns out to be a thin coating of reddish oxide against the inside of the mouthpiece), is first indicated by inability to get a good face. It eventually looks frosty, and the giveaway is that no amount of heat has much effect.

But suppose your mouthpiece looks good, with nice deep vents, and you'd like to be sure about the dross before you take it off. How to know?

I am about to reveal a carefully guarded trade secret. Thirty years ago I found out about dross in the throat, and tried to figure out how to be sure before removing the mouthpiece. I drilled holes in the side of the throat (which I later plugged with screws) so I could look in. I tried to push a flashlight bulb up inside the throat on two wires. I even investigated buying one of those lucite things the doctor uses to look around curves inside of your stomach — but that was $650. After much experimentation with those same old crucibles at Edlund's, I figured it out. Here is what you do (and I've never told but one person before):

Have the pot full of metal, and hot. Take off the pot top, the short line stop bracket, the splash shield. Have somebody with well padded hands and arms hold a pig-mold under the mouthpiece. Now bring the pot forward until the metal pours out of the mouthpiece in thirty little streams. If any hole is even partly clogged, the stream will not be full and round and properly curved. You will see at once the difference. This test has never failed. If you find a hole like that, you will find something behind it that doesn't belong there.

I believe that most dross in the throat or up against the mouthpiece is caused by a combination of things: allowing the metal level to run low in the pot, failure to skim off the dross, lack of care in keeping ordinary trash out of the metal. Nor do I discount the importance of maintaining theoretical proportions of the metal, and by no means would I countenance contamination of the metal by zinc, copper, and other impurities.

Read what I said about metal again. I said that I had quit using poor metal as an excuse for casting trouble. That is not to say that poor metal will not lead to dross in the throat. It might. I don't know. Don't take a chance.

Quick Drop Will Improve Face on Big Sizes

QUESTION: We have recently bought a font of 18-point Gothic, but we are having trouble getting a good face on it. A machinist from a nearby town has checked over the pot and lockup and put on a new mouthpiece. What else can we do? — A.B., Bucklin, Kan.

LOOMIS: If your crucible throat is clean, your mouthpiece well vented, and the vents open enough to throw a fair-sized sprue, your plunger making a good full stroke, and your slugs reasonably solid, then I suggest you send to the company for a quick drop. This gadget is fastened to the plunger cam and can be flipped in or out of use in a few seconds. When you want to cast heavier faces, you put the quick drop into operation. It has the effect of making the plunger cam extend farther and break more sharply, so the drop of the plunger is delayed and then comes all at once. This will give you a better face, usually with the sacrifice of some solidity in the slug.

With bigger type — 24- and 30-point in heavy faces — you will need a quick drop and everything else you can get, but, even so, do not expect to cast slugs that will print on enameled stock. Both companies have done a lot of work

toward securing better printing surfaces on 18-point and larger, but linecasting display type is still largely newspaper material.

On big stuff it sometimes is difficult to get a good face at a certain spot on a certain word. This is caused by the mat itself, for the way it has to be made throws up an obstacle to the smooth flow of metal. In such a case, try shifting the word to right or left. Sometimes half a pica will make a big difference.

MISCELLANEOUS SLUG TROUBLES

Letters Foll Off of Slug

QUESTION in *The Graphic Arts Monthly:* I enclose a 9-point, 13-em slug, cast on a Model 14. We get from twelve to twenty slugs like this to the galley. The lower case *o* seemed to peel off when I rubbed my finger across it. It is not the mats, for they run fine on our other machine. I have cleaned out the throat and the mouthpiece. I don't think it's the metal, because the other small machine uses the same metal. Can you suggest something? — B.C., Parkston, S. D.

HARDING: I believe so. The mouthpiece hole on the left end is nearly all cut off. This hole that is partly closed causes the metal to spray to the right, so the metal cools too fast. Raise the pot on the left side about half a turn of the adjusting screw. This should swing the hole over onto the slug unless you have seated the mouthpiece too far to the left — which is not likely.

Slug is Cold on One End Only

QUESTION: I have always had trouble getting a good sharp face on the right end of the slug. Do you think this indicates dross behind the mouthpiece? — C.N., New Braunfels, Tex.

HARDING: No, I don't think so. Here again the slug is missing a mouthpiece hole. This time it is the right end, and the hole is completely covered, as you will see by observing the long open space on the other end. Maneuver your pot legs. You might have to take off the mouthpiece and move it over — in which case I suggest putting on a new mouthpiece. In a case like this, use the test given under *What to Do if Mouthpiece Location Is Lost,* page 176, to be sure the mouthpiece is in the right place.

Hollow Slugs — Causes and Cure

QUESTION: We are having complaints because sometimes a slug from one of our machines caves in on the dry mat roller. Will you go into this trouble?

HARRY G. POTTLE in *Who's Who in the Composing Room:* Such slugs usually feel light when you pick up a handful. Saw a sunken slug in half and

you will find an air cavity underneath the sunken letter. Usually such a slug breaks easily in the fingers. This is an old trouble that has acquired new importance with modern stereotyping machinery.

There are three fundamental causes of hollow slugs:

1. Imperfect pump action; 2, incomplete solidification; 3, ventage.

The second is due to excessive heat or unusually poor metal; the third has been discussed under *Venting the Mouthpiece,* page 178.

Let us consider the first one here. The intake holes in the sides of the well must be cleaned out, and the plunger must ride just above them. As the pot moves forward before the cast, it also rises, and the bottom of the plunger closes the holes before the plunger descends. An oversize plunger cam roll will raise a plunger that rides too low.

The plunger works well at from .002″ to .0035″ clearance in the well. Oxides will interfere with free movement of the plunger and cause hollow slugs. A worn plunger can hardly be replaced with a new one to advantage. The well is bigger at the bottom after years of use. You can buy a new crucible. The job of reaming is for an expert with plenty of equipment.

The stress of the plunger spring is important. It has been my observation that the smaller expansion-type springs suffer more from spring-set than the bigger compression springs. These are not expensive and should be among the first replacements when you have casting trouble. When you take off the old one, compare its length with the new one. Usually you will find the old one shorter.

Where the slugs are subjected to extreme pressure, as in dry-mat rollers and making wax molds, better slugs will be obtained with less spring stress; the pump lever should have a roll with roller bearings to minimize wear.

A plunger should have a full stroke. On short slugs you may have to drill a hole in the bottom. Drill a ⅛″ hole part way and follow through with a No. 52.

In my opinion the condition of the metal supply is more responsible for oxides in the throat than anything else. The melting point of antimony is 1166°, and there would never be enough heat under the pot to melt it if an accumulation of excess antimony should occur.

HARDING: When the metal or mouthpiece is too hot, the metal in the base of the slug does not have time to cool before the metal pot backs away, and the molten metal runs out of the mold. This does not look like the hollow slug Pottle talks about, but it makes an unsolid bottom to support the slug.

A low metal pot, a dry bearing, dross ring in the well, or mouthpiece badly out of alignment with the mold, may cause hollow slugs. If the first slug is solid but they rapidly become hollow, look for the plunger riding too low in the well.

See that the plunger lever makes a full, free stroke when the plunger is disconnected. If it doesn't, remove the plunger spring and clean and lubricate the bearings.

IMPERIAL METAL COMPANY in *Type Metal Alloys*: The following will cause hollow slugs: loose or tight plunger, hot or cold metal, dirty metal, weak spring, mold disk hot, mouthpiece holes clogged, vents too shallow or not open at the bottom, throat clogged, deteriorated metal, roughness back of the mouthpiece.

LOOMIS: There isn't much left. These boys have covered the ground. But I'll tell one that shows what a traveling machinist gets into. It was on a machine in a small plant here in Minneapolis. I rebuilt the pot and somebody else put it in the machine. They got shells only, and I got the blame. But it turned out that somebody at some time in the past had put a transfer spring in place of the plunger spring. They had made a hook at the bottom so the spring went on all right and you wouldn't notice, but the spring did not retain its stress and went down with a soft, mushy action. It took me several hours to put the finger on this one.

What Causes Chilled Slugs?

IMPERIAL METAL COMPANY: Lack of heat, an undersize plunger, too much water or air used for cooling, dirty mouthpiece or jets, poor lockup, improper pot alignment, unfit metal, lack of ventage, and sometimes lack of tension of the plunger spring.

HARDING: Also drafts, dirty plunger, poor lockup, or oil in the mold cell.

LOOMIS: Do not forget dross behind the mouthpiece. I remember when I hit a little town west of Lincoln, Nebraska, with $1.56 in my pocket and the gas-tank almost dry, and I — that was dross behind the mouthpiece.

Chilled Spots on Large Type

LOOMIS: This agrees with my own experience. Many times on large type you get a chilled spot at the same place on a certain letter, but move the word 6 points one way or the other and it is all right. Apparently this results from the stream of metal hitting divisions in the matrix die which deflect the metal. The Ludlow avoids this entirely by using a slot instead of holes. Thc slot runs the entire length of the mouthpiece, and thus there can be no cold spots.

Frosty Face on One End of Small Slug

QUESTION: When I get to hanging the elevator on straight matter, invariably the right end of the slug comes out frosty. It won't do it on the first dozen slugs, and if I went slow it wouldn't do it at all, but it is hard to tell the boss on pressday, "Yes, I know you need the type, but I can't hang the machine because the slugs will get cold." — K.B.T., Gallup, N. M.

LOOMIS: I have several times faced this trouble — once on a memorable night west of Huron — but maybe I've told that one before. There are a number of things to check. For some reason they never seem to cure the trouble, but here they are:

1. It doesn't help much to raise the temperature.
2. See that the slugs are good and solid, which indicates proper ventage.
3. Be sure the throat is not clogged with oxides.
4. See that the plunger is raised above the holes in the well.
5. Gas throat burners must be burning properly.
6. Be sure both end holes of the mouthpiece show full and are not partially obstructed.

One quick remedy is to drill the mouthpiece holes a very little bigger — but this can lead to complications. Here is what I have found: Check all the above items, then check the pot packing and all burners and deflecting or baffle plates. See *Packing the Crucible,* page 198.

This latter job, if thorough and careful, will generally do the work.

What Makes Shiny Bottoms on Slugs?

HARDING: The first thought is cold metal. If this is true, the face of the slug will have the characteristic melting ice appearance. Anything that causes a poor lockup will cause shiny bottoms, and this probably is the most frequent cause, for obviously if one end of the mold is held away from the mouthpiece, there will be more metal there to trim off.

Also metal on the back of the mold, a dull back knife or a back knife screwed up until the heel rubs against the slug, broken pot lever spring, tight upper bearing of pot lever.

LOOMIS: In summary, most shiny slugs go back to one of three causes: poor lockup, improperly set back knife, or cold metal. It is also true that a worn mold disk stud — usually the old-style small stud — will cause a very mysterious slick bottom. The knife seems to start digging, and the play at the end of the stud seems to encourage it. See *Setting the Back Knife,* page 217.

What Causes Stuck Slugs?

IMPERIAL METAL COMPANY: Dirty molds, warped mold cap, bad liners, hot metal, weak clutch spring, oily clutch leathers, (rarely) dull trimming knives, jammed ejector blade, low metal level, knife wiper does not drop low enough to permit the blade to clear, no play between forked lever and collar (see *Starting and Stopping Adjustments,* page 250), metal between mold cap and liners which makes the slug thicker than it should be.

CHAPTER XX

HEATING THE POT

Gasoline Burners

HARDING: These are capable of very hot flame, and where they are used one should use also a pot plug, described in *Pot Relief Plug Will Help Prevent Cracking,* page 156, to prevent a cracked crucible. Some gasoline burners feed by gravity, others by pressure. The operation is the same.

All burned-out parts should be replaced. The burner cap must fit squarely on the base.

In disconnecting, let a quart of gasoline flow from the pipe under pressure to expel sediment and water. Use extreme care when connecting the hollow wire tubing to the burner, for it is hard to repair the couplings; solder cannot be depended on.

In some, gasoline is filtered through a brass tube full of gravel. The other parts are the same.

Cleaning a Gasoline Burner

HARDING: 1, Disconnect the gasoline line with a wrench, not pliers.

2. Pull out the support rod and take out the burner.

3. Lift off the cap.

4. Remove the two screws from the feed pipe, to free the control and needle valves.

5. Loosen the mouthpiece burner set screw and pull off the mouthpiece burner.

Brush, wipe and punch out all soot and oxides. Run a very fine wire through the needle valve opening but do not enlarge it. If there is a bulge in the cap, replace the cap; also the needle valve if it is corroded.

The gravel tube, the two slotted screws in the ends of the gas tubes below the plate, and the two square head screws near the needle valve must be removed while hot. Always put grease graphite on these screws when replacing. Yellow litharge and glycerine should be used on joints.

Remove the gravel and wash it in gasoline. Blow through all gas passages. See that the needle point is sharp and the end smooth and straight.

Re-connect. Use wood alcohol to generate, to avoid soot. Adjust the needle valve for the best blue flame. Use the control valve to regulate the flame. Use only heating and lighting gasoline.

When gas escapes around the control valve, unscrew the bushing and wind a thin strip of rope asbestos around the rod.

Metal dripping from a minutely cracked crucible is invariably encountered on gasoline pots because of the intensely hot flame. Use the pot relief plug.

How a Gas Burner Should Work

LOOMIS: The following applies to either natural, artificial, or bottled gas. You want a blue flame. A *floating* blue flame indicates too much air. A yellow flame indicates too much gas. Bottled gas burner orifices must be smaller than those for natural gas. Bottled gas cannot be controlled in any other way.

Keep burners free from soot. The throat burners should be about 2" long, bent toward the front, and the tops flattened to spread out the flame. Most pots require a baffle plate between main burner and throat burners to assure air to the throat. Be sure the baffle plate is in place that protects the mouthpiece burner from the throat draft, for his draft is oxygen-less and will not allow the mouthpiece burner to burn properly.

The crucible flues, one on each side of the throat at the top, must be open, and the top of the pot jacket must provide escape for the exhaust air that comes up these flues; otherwise the fires will be smothered.

Governors

HARDING: There are many types of main line governors. Your gas installation man will handle this. Let us be concerned with

Pot Governor or Thermostat

It is well to remember that there are two ways of making an expansion thermostat; you can have the expansion rod in a fairly stable case, or you can have a stable rod in expansion case. The only difference is that the adjusting screws work in opposite directions.

Even most older types of expansion thermostats will work well if cleaned, graphited, and adjusted.

The mercury thermostat is now obsolete. It gradually lost its expansive power and allowed the metal to overheat, which in turn further damaged the

mercury tube. Wherever this type has blinked out – usually shown by very slow responsiveness and consequent extreme variation of metal temperature – it should be replaced by F-3425 or a similar thermostat.

Electric Heaters

There are many types of electric heater. Books of instruction are still available for most of them.

As with all electrical equipment, when trouble occurs, look for blown fuses, loose connections, bare wires, dirty contact points, or misadjustment of the thermostat.

Loomis: I am very fond of a bell-tester if the trouble gets complicated. With a bell-tester you can detect rather small grounds by connecting one terminal to the machine and the other to various wires (sometimes necessary to try this with the machine in motion); you can also ascertain if an element is still working or if it too has a ground – in other words, if juice is leaking through it.

Most of the trouble in electric pots seems to come from grounds. These are small leaks, not serious enough to become shorts but nevertheless destructive of the efficiency of the heating equipment. *These cannot be located with a lamp tester.* There must be a ground tester such as a bell box (old style telephone box with a magneto turned up by hand). A neon tester will show smaller grounds, but I have been unable to rely on it.

The worst job I ever got into was in a flour mill, with an Intertype electric pot. The heating began to go haywire. It was tested by every electrician in the country, with no result. I went over and spent eight hours. Still no result. Finally the plant electrician and I got together on it. At the end of twelve hours of exhaustive tests, I discovered the fault, entirely by accident. An invisible film of matter had settled on the slate panel board out of the air, so that it would ground any juice that came into it. A neon tester touched to the board, with the other contact grounded, would show a faint glimmer. We put on a new board and the trouble was over.

Linotype Heaters

On most machines these are four: two main pot, one throat, one mouthpiece. The throat and mouthpiece must be bought for the proper voltage; the pot elements are always stamped 110; they are connected parallel for 110 and in series for 220.

The first Linotype heaters were high-low-and-medium. Then came the rheostat, then the dynamic thermometer (mercury tube), now the mechanical thermostat.

A Linotype will run on one pot element, but it takes two or three hours to melt down. If either throat or mouthpiece element burns out, you cannot get a slug.

Mouthpiece elements with the terminals at the bottom of the pot most often give trouble because metal has run down around the terminals.

On pots of long usage, look for metal touching wires or terminals under the pot top. Especially look for wires with broken insulation. These wires near the crucible have a special asbestos insulation; any other kind will crumble in a few days.

The crucible must be removed to install a throat heater, and on most pots there is a hole under the throat through which you can reach the head of a screw that must be loosened before the heater can be removed.

The very earliest Linotype throat elements were removed from the bottom without taking out the crucible.

The Linotype mouthpiece element is held in place above the mouthpiece by a clamp, and can be readily removed after the pot top is off.

To Remove the Crucible

LOOMIS: This may take some doing. Loosen the set screw at the left of the mouthpiece — although the pot jacket will spring considerably. Pry up a little near the left front lug with a screwdriver. Use penetrating oil on all lugs, especially the back one, which generally is the hardest to break loose. Sometimes you will have to pry on both sides at the front at the same time. When you get the front end out of the lug sockets, put 6-point slugs under the lugs to hold them up. Now tackle the back one.

With a very large screwdriver, try to pry up the lug, working between the jacket and the crucible. Don't be tempted to do much hammering to loosen it. Those lugs are only cast iron. It may be necessary to run a fairly heavy wire in under the lug and make a loop through which to use a three-foot crowbar for lifting. Then, while you lift with one hand, pry and work the crucible with the other. This is sometimes stubborn but not difficult. Just don't break the lugs or the pot jacket.

To Remove Linotype Crucible Heaters

Remove the pot top. Disconnect the wires. Sometimes these heaters are solidly imbedded in dross, and you may have to pry them loose, a little here, a little there, with a big screwdriver — but gently, so as not to puncture the envelopes. One of these heaters probably is still good.

If the pot is frozen over: If 220, connect the good element to 110-volt circuit; it will take two or three hours but it will do the job.

You can completely melt down the pot with a blowtorch on top, if necessary.

In taking out elements, dip the metal as low as possible. Let the heaters get hot but not red hot; your thermostat rod, not being immersed, will not turn off the current, so watch it. Some heaters will quickly become red hot. This isn't good. With the metal hot, turn off the juice, disconnect wires, lift the elements clear of the metal. Dip out all metal promptly.

Clean out the dross. If there was a clamp holding the elements in place, we presume you loosened it. If there was not, put one on. This is held by an 8x32 screw, and no doubt you will have to drill and tap the hole — or at least tap it. Tapping can be done with the crucible in the pot; drilling *can* be done, but takes patience and ingenuity. Some m-o's use a drill in a small hand chuck. Use cutting oil too.

When you put in the two good elements, be sure they are held firmly in place by the clamp.

New Linotype Mechonicol Thermostot for Electric Pots

This also can be applied to outstanding pots, and is very successful. There are varying opinions as to whether or not the bugs are all out of the Micro-Therm, but the mechanical thermostat is truly a dandy. In replacing a mercury type, you will need a pot top also. Be sure the expansion rod does not touch the bottom of the pot. Washers usually are needed. The old pot top can be used, but it is a lot of monkey business to get it drilled.

For maintenance, see that the wires are firmly screwed down, the contacts and roller reasonably free from pitting and corrosion. These can be removed and filed with a magneto file and ground on a smooth stone. If improperly installed, the expansion apparatus may become bent, and should be straightened.

There are two adjustments. Take off the cover.

1. Turn the top adjusting screw so the two levers are separated about 1/16". With the metal at normal heat, set the lower adjusting screw so the roller is about in the middle. Now you can use the upper screw for finer, periodical adjustment.

Linotype Control Ponel ond Fuses

Harding and Loomis: There is one horizontal fuse (5 amps for 110 volts, 3 amps for 220 volts) inside the panel box to protect the mouth and throat circuit. There are four fuses outside of the box (20 amps for 110, 10 amps for 220). A neon tester is the easiest and safest instrument to use on fuses. Touch one contact to one end of the fuse, the other to the box (or to your finger; it may tingle but it won't hurt). With the juice on, you should get a glow (from the neon bulb, I mean). If the fuse is good, you'll get a glow from either end.

If the fuse is blown, one end will light but the other won't. Of the four fuses, the upper two usually lead to the pot, the lower two to the motor.

The clapper switch is either on or off. It should of course be free on its hinge pin. The contacts on the clapper switch should come up evenly and contact the fixed posts at the same time. The contact arms can be bent to secure this.

The contacts should be reasonably free from corrosion. If necessary, remove them entirely and grind new surfaces on a fine wheel. Finish with fine emery cloth. *Do not use emery cloth in the box,* as it sheds material that is a conductor; use sandpaper instead, unless you have removed the contacts from the box entirely.

At the lower left of the clapper switch is a small plunger which makes contact with a brass extension from the switch. These contacts also should be clean, and they should definitely make contact when the switch closes. The brass can be bent. Sometimes the plunger or the brass tube wears to bind the plunger. The brass tube comes off by unscrewing the nut at the rear, which also provides an adjustment. The plunger slips in from the rear.

On alternating current there is always a hum, which sometimes reaches an annoying level. This can be controlled somewhat by tightening the screws in the bottom of the clapper switch where the hinge pin goes through; some operators slip on washers made of copper or brass thin spaces. I have had best luck with a brass thin space fastened down by one of these screws and bent at right angles to bear against the right side of the lower end of the clapper switch. Just be sure, no matter what you do, that the clapper switch falls freely of its own weight.

The long, round resistance coil at the right of the box is either good or no good. Take it out and test it with a bell tester.

The field coil, around the core that closes the clapper switch, is either good or no good. If you suspect it, take it out. Lay it on the bench and hold a large screwdriver firmly on the bench through the hole. Connect wires to the two terminals; plug in one to a live circuit, and *barely* touch the other one to the ground wire. If the coil is good, it will jump upward around the screwdriver. (This test courtesy of Lawrence Morris.) *Do not* maintain a circuit through the coil, or you will burn it out.

Other things than a burned-out coil can cause failures of the clapper switch, however – and usually do. In 99% of the cases it will be a failure of the thermostat, which we shall take up a little later.

The Linotype Rheostat

This is the round thing which has an adjustable dial. It is made of one fixed contact and a series of buttons of varying resistance. One button can burn out and the others be all right. To locate the burned-out button, test the lead-in

wires with one contact of a neon tester on the screws, the other on a finger; the live one will glow. Disconnect the other. Turn off the juice. Take off the rheostat so you can see the buttons. With the lead wire not grounded anywhere, turn on the juice. Use the neon tester to find out where the glow suddenly quits, and this is the burned-out button. Solder a piece of copper wire to connect the posts on either side, so it will not interfere with the rheostat arm. Order a new rheostat.

Remember, this controls only the throat and mouthpiece.

Micro-Therm Heater

HARDING: This does away with thermostat and panel box. The rheostat is quite small, and includes both a manual and an automatic control. This equipment may be applied to outstanding machines, but the four heating elements also must be replaced. They look different but are cared for and tested the same. The controls are operated by a non-volatile liquid, and in severe cases of overheating are subject to damage the same as the old mercury control.

For care and adjustment of the Micro-Therm, write to Mergenthaler Company for their literature. This is readily available.

Intertype Heaters

HARDING: Intertype pots have one element for mouthpiece and throat, two for the main pot (these fit on the outside of the crucible). These latter two are wired in series for 220, parallel for 110, as on Linotypes.

Intertype Electric Thermostat

HARDING and LOOMIS: The first type has two contact points at the top, and a lever pivoted on two ball bearings. Most trouble arises from broken fiber insulating washers (often none at all), and from installing the lever cold and tightening it too much. Cold, it should have at least 1/32″ play between the ball bearings. Check it as the thing heats up.

Adjust the screws to allow about 1/32″ between the contact lever and the post against which it is not resting.

The newer style thermostat is turned upside down, but is essentially the same. The fiber washers have been eliminated, which is an improvement. These are both good thermostats if they receive half-way adequate care.

Watch for distortion of the expansion rod — as on any thermostat of this type.

Testing Intertype Heating Elements

If the throat element or rheostat is inoperative, the machine will not cast a slug. If a side crucible unit is open, the metal on that side will stay solid. They can be tested with a plugged-in light bulb or a bell tester.

Intertype Control Ponel

HARDING and LOOMIS: This also has a clapper switch very similar to the Linotype switch. As on the Linotype, the opening and closing coils carry current only at the instant of contact; the movement of the clapper switch shunts the current away from the coil.

Closing Coil Control Springs in Intertype Old Style Panel Box

A stud or shaft passes through a split bearing in the rear end of the notched contact arm. When the circuit is open, the stud presses against the springs; when it is closed there should be 3/16″ clearance between springs and stud, secured by bending the springs. See that the stud makes contact with both springs.

To Remove Intertype Throot Heoter

Disconnect the three thermostat wires. Remove four screws from corners of the thermostat base, and two at the sides, and the thermostat can be removed. Remove the pot top. If the plunger is frozen in the well, you will have to disconnect the plunger spring, remove the pump stop bracket and the whole pump bracket assembly. Remove terminal cover and clamp, disconnect the lead wires, and pull out the element.

To Remove on Intertype Side Element

Disconnect the thermostat and remove. Remove the two flat-head screws at the sides of the expansion rod. Take off pot top. If plunger is frozen in, same as above. Remove terminal cover and clamp, disconnect lead wires, pull out element.

Lower Pot Thermostot on Monomelt Equipment

To adjust, remove the large screw cap from above the expansion rod and turn anti-clockwise for less heat. There is another finer adjustment in the small make-and-break control box. Use a 1/16″ pin punch or similar small rod to turn the screw head at the bottom. Turn to the left for more heat. Don't touch other metal with your turning instrument or there will be fireworks. A round toothpick is safe and therefore easier to use if the screw is not too tight.

To Remove o Dynomic (Mercury) Thermostot

Engage contacts L and C. Remove the pot top, turning off the current when you lift it. Turn current on again and through L and C, heat the metal to about 650°. Dip out enough metal to expose the thermostat bulb. With the power off, disconnect the three wires and label them. Remove the two screws behind the thermostat coil and lift out the thermostat.

Elements thot Squirt Metol Upward

Occasionally on immersed elements there will be a "hot spot" that causes metal to splash over the machine, sometimes on a very high ceiling. Throw a handful of loose slugs on top of the metal at the spot where the break-through usually occurs, before melting down.

To Remove Thermostot From o Frozen Pot

This is not difficult. Disconnect lead wires. Remove screws from base of thermostat, then remove screws from the base that holds the thermostat on the pot top. On an Intertype, the screws that hold the thermostat to the expansion rod must come off. On a Linotype, the thermostat is held to the rod by a nut.

Monomelt Upper Pot Adjustment

Remove the cover. The adjustment screw is at the right side and bears directly on the expansion rod, which in this case lies horizontally.

When Pot Foils to Heot

HARDING: Be sure the switch is "on."

Use the neon tester to ascertain that current is reaching the panel box.

Test fuses.

Look for a loose connection at the thermostat.

Be sure contacts at the thermostat are clean.

Be sure the thermostat contact lever is working.

Test coils and elements, and test for a ground or an open circuit.

When Metol Overheats

HARDING: Generally this is a failure of the thermostat.

See that all contacts are clean, especially the brass projection that touches the spring plunger at the left side of the linotype clapper switch, and the thermostat contacts. See that clapper switch and thermostat contact lever move freely.

Test for a ground, which will produce a larger-than-usual spark as the contact lever of the thermostat makes or breaks contact. Such a spark may spot-weld the contacts.

Mouthpiece Does Not Heot

Sometimes a burned-out throat or mouthpiece element, either of which will open the circuit. Sometimes metal shorts out the wires or contact points. More likely, however, it's in the rheostat. Try turning it to a different spot.

Testing for Grounds

HARDING: For some reason this is often puzzling to electricians, but I favor the bell tester used by Loomis. First touch the two wires together as you crank briskly, to be sure the bell is working. Then put one terminal on the machine and touch the other to various electrical parts — wires, terminals, element jackets, thermostat frame, etc. Watch to see that you get a ring when you should, and not when you shouldn't.

Fluttering Switch

If the thermostat contacts do not make or break positively, you will get this. On the mercury thermometer there is a flat spring on the back side of the contact lever, which should have enough tension to prevent the lever from vibrating, but not enough to prevent free movement of the lever.

In the new style Linotype, have enough tension on the spring wire that carries the roller to prevent vibration. It should go over the middle contact and stay put.

The spring plunger at the left side of the clapper switch must make firm contact.

On Intertype, check the 1/32″ space between thermostat contacts; if it is not there, you may get fluttering. The short coiled push spring may be defective. And the space in the panel box (old style) between the diagonal closing coil contact springs and the horizontal stud below must be 3/16″ when the switch is closed.

When Resistance Coil Burns Out

HARDING: A temporary substitute is a 150-watt light bulb.

Electric and Gas Pots Interchangeable

These are freely interchangeable.

Packing the Crucible

Electric pots are packed with dry asbestos, gas pots with wet. On either type, the mouthpiece at the last is packed firmly with wet asbestos to prevent squirts from going inside.

Use good flake asbestos, preferably mixed with a little Portland cement or magnesium sulphate if it is to be used wet.

On an Intertype electric, the Company recommends turning the pot upside down and packing as much as possible, then finishing right side up. At any rate, on either, fill all the loose space with asbestos.

(LOOMIS: Don't tell on me, but I generally use wet asbestos to form a protective shield over the terminals under the pot top. Of course this will short circuit if the juice is turned on before it dries. But once dry, it protects the terminals from stray metal.)

A gas pot is packed differently. Make a thick paste. Remove the crucible and pat into place about ½" of wet asbestos all around. (LOOMIS: I personally leave an open space around the top of the crucible, but some fill this in.) Put the crucible in place. Check to see that the two flues, one on each side of the throat, are unobstructed. Also, in front of each flue you will need an opening about the size of a pencil to act as a chimney for fumes from the mouthpiece burner. A really good packing job, done wet, requires a couple of days, for the asbestos shrinks and needs repatting into shape as it dries. But you can do it at one fell swoop if you have to.

Pack also the pot top, seeing that you leave space for the fumes that arise from around the crucible and from the two flues. Finish by putting on the top and packing around the throat top and bottom, to isolate the mouthpiece.

Be sure the deflecting shield is in place to protect the mouthpiece burner from the waste gas from the main burner.

When first melting down an empty electric pot, try to keep slugs flat against the heating elements, or fill the pot with shavings from the saw, to avoid operating the heaters in open air.

Pot Heat Creeps

QUESTION: I get my heats all nicely set at 525°. Then next week they are back up to 550° — and this happens invariably. What is wrong? — M.C.J., Lawrenceburg, Tenn.

HARDING: First, there must be space between the bottom of the expansion rod and the bottom of the pot. However, all pots creep. This applies, I think, to any type of thermostat, gas or electric. If the thermostat is the expanding-case type, the heat will creep up; if the rod is the expander the heat will creep down. It is very seldom that you find one that does not change.

LOOMIS: I would say never.

Can Mercury Tubes Be Repaired?

QUESTION: The heat range on my pot sometimes is almost 100°, and I understand this is because mercury has escaped from the tube. Can this be repaired? — L.K., Heron Lake, Minn.

LOOMIS: It cannot. Replace it with the mechanical type thermostat.

To Remove the Metal Pot

HARDING and LOOMIS: Occasionally this becomes desirable for the small-town m-o. This can be done without removing the mold slide, but for one without experience it will work out better to remove the mold slide. These are the steps:

1. Dip the metal from the crucible, remove the plunger, and turn off the heat.

2. Remove the thermostat, disconnect and tag the wires. If a gas pot, disconnect the thermostat and remove the burner.

3. Turn the machine until the pot moves forward, and pull out the pot balancing spring, then allow the machine to move around to normal, and far enough to let the elevator head barely rest on the vise cap.

4. Lower the vise to second position (have you disconnected the link and the vise closing link?).

5. Remove the splash shield.

6. Remove the ejector link.

7. If a water-cooled disk, disconnect the pipes. If air-cooled, unfasten the blower pipe. If not cooled, relax.

8. If a Linotype, set the blade at 12 picas and take out the long screw; drop the controller.

9. Lower the mold cam lever handle and pull out the mold disk and slide. Watch the ejector slide if it is old style.

10. Tie the metal pot forward to the face plate.

11. Loosen the set screw in the pot lever shaft (Linotype) or remove the screw from the center of the shaft (Intertype) and remove the shaft. Note exact position of washers on Linotype shaft.

12. Remove the pump stop bracket.

13. Loosen the front pot leg adjusting screws and remove pot leg caps.

14. Replace the pot lever shaft for use as a handle.

15. Get an old main drive belt; run it between the pot legs and over your shoulder. You can now lift the pot while somebody steadies the legs; move the pot forward and out.

In replacing the pot, put hard oil on the nipples of the pot leg bushings. Be sure the nipples go into their proper holes in their pot legs. Watch out for fingers. When you get all through you should have ten.

Some m-o's take off the mold cam arm, but that should not be necessary. Others take off the pot plunger bracket, but that involves several operations, and the pot can be maneuvered out without it.

CHAPTER XXI

FRONT SQUIRTS

Front Squirts Caused by Loose Lines

HARDING: Many front squirts are caused by loose or squabbled lines. This may be caused by the operator, or it may be the result of misalignment of the first elevator jaws with the line delivery rails, or nicks in the jaws, or faulty line delivery slide. A very tricky one is main shaft bearing starting to freeze up, which looks exactly like mold slide set too tight.

Tight Lines

A tight line will cause a squirt if the vise automatic is not adjusted to stop the machine.

Misadjusted Pump Stop

If it allows loose lines to cast, it will make hairlines and occasional squirts.

Damaged First Elevator Duplex Rail or Elevator Jaws

Sloppy fit, worn back jaws, or anything that will allow a matrix to climb half-way onto the duplex rail, will result in a malformed toe, and if the mat is a thick one, a squirt.

Often too a matrix that has been thus swollen on the toe will go through the magazine and bind in the jaw the next trip around, hindering justification and causing a squirt.

The old Linotype duplex rails with only two lugs were weak in the center and would bend if sprung in by a mat that jumped up, thus making it easier for the next one to jump up.

Elevator jaws that are too tight will prevent spread of the line. Sometimes mats bind only in the bold-face position.

A broken jaw spring pawl or too long a spring pawl screw will cause squabbled lines.

Double Roised Lines

That old bugaboo, the legendary double-black of every operator, of course causes delightful front squirts. One can buy a safety device for almost every machine, and it is worth the price. Double-black lines also have hang-overs, because they usually swell the toes of a number of mats, which later bind in the jaw. On a Linotype the line starts spreading from the right, so generally such an obstructed line opens the pump stop for a cast. Most Intertypes, starting with the old 42-em 72-channel display machine, have a block that prevents a cast if anything keeps the pot from going forward fully.

Forword Thrust of Mold Disk

If the mold disk comes too far forward it will prevent spread of the line and often cause a squirt.

First Elevotor Downstroke Misodjusted

Either too high or too low, mats may bind and cause a squirt.

Cleoning up o Front Squirt

HARDING: Don't be rough. Front squirts can be cleaned out with a surprisingly small amount of force.

If a little metal has run along the combinations of the mats and the machine stops at transfer, raise the second elevator by hand to be sure it is clear. Lock the spaceband pawl and let the machine come to normal.

Open the vise, put a piece of furniture against the mats, lean the weight of your body against the elevator, and tap out the matrices.

When metal holds several mats together, spread the end mat away from the others with a screwdriver, then work it off with a pair of pliers. If they are too much imbedded, wind a piece of string around them and dunk in a clean metal pot several times; tap them at the pot top as you bring them out; let them cool. If you leave either mats or bands in metal too long they will be softened.

LOOMIS: Don't be rough. Don't gouge jaws or molds with steel. Don't get in a hurry to yank off molds or jaws. I have seen very few squirts, if any, in thirty years. that could not be cleaned out with small force and no dismantlement.

For mats well embedded in the jaw, look first to the counterbores for the two big screws that hold the first elevator front jaw in place. If the metal has lapped over into these, pry it out. Then I take a large screwdriver and lean against the mats from the left side. Usually this is persuasive. Hammering can be done if necessary. You may ruin the end mat, but the time saved is worth much more.

Now, with metal around the duplex rail put your abdomen against the first elevator to support it. Take a solid 12- or 14-point slug, lay it lengthwise,

edge on, against the rail, and hammer the rail in. The squirt metal will pop out. Try the rail to be sure it is free.

Squirt Metol Around the Mold

HARDING: Use a small steel-handled screwdriver to chisel through the metal that flowed up over the mold cap. Cut – *gently* –a groove along the corner of the mold cap, then drive what is on top of the mold cap through to the back.

LOOMIS: Some m-o's melt the metal from a mold cap screw hole. It may be this can be done safely, but I'm scared. One way is to remove the mold, tapping from behind with a pig, grip the screw with a pair of pliers and take it out through the bottom; then drill out the metal. I am loath to recommend this, for it involves removing the mold, against which I am firmly. On rare occasions I have done it, but usually, by working your mold cap screwdriver as a drill, you can reach the slot in the screw head, and then you can turn out the screw.

With metal around the mold screws, loosen them one at a time, clean out the metal, and re-tighten. This can apply to the alignment plate screws also.

Now there is the matter of metal around the mold locking stud, which at first looks impossible without removing the mold. But wait. Tap a little, pry a little. Get out all you can. Then get your small screwdriver in under the metal and start a rotary motion. With a little persuasion the metal will move, for there are no big crevices in which it can lodge – and the fight is over. Keep moving around and lifting, and you get the whole business out.

Now there is left the difficulty of the first elevator that gets embedded in metal on top of the vise cap and won't rise, won't allow you to open the vise, won't even let you go out for coffee. This also will yield to patience and persistence as well as to force. (Persistence means force applied in the same total energy but in smaller packages.) Probably the disk is still forward. Lower the mold disk cam handle and pry in various spots until you find a weak one, then break the disk away from the jaws. If the metal has run into the jaws, you can do a certain amount of prying between back jaw and disk – but not too much, or you will twist the back jaw. Between the left-hand vise jaw and the disk is a safe place, with a piece of cut base to protect the mold if there is one there. Having gotten the disk back, now try prying up the first elevator. This is a fairly safe operation, but you may find overlaps of metal that have to be worked out first.

At any rate, remember this: cleaning up a squirt is a process of digging away a little metal at a time, here and there. Don't try to get it all at once.

Check the Vise Automatic

HARDING: Don't neglect this, for the vise automatic is in a fine place to receive squirts. Check the dog and the stop rod pawl. See that they work freely.

CHAPTER XXII

EJECTION

To Adjust the Ejector Lever Powl

HARDING in the *Graphic Arts Monthly:*

On machines with an inside galley, the ejector blade should advance 1/32″ past the back plate of the galley. On machines with outside galley, the blade should clear the vertical edge of the chute 1/32″.

On the right side of the gear cam in back you will find a lug that engages the ejector pawl. This lug often works loose. If tightening does not hold, get a new lug, pins, and bolt. They come now with a narrow lock washer.

Be careful in unscrewing the adjusting screw, which lowers the pawl for a longer stroke. If you get it too low, one cam will be pulling it forward while another is trying to return it. This is an unhappy situation, for cast iron breaks.

To Remove the Ejector Lever Powl

HARDING: Remove the nut from the pawl screw. Turn the screw out until it touches the cam. Push in the clutch, back the machine until the second elevator starts down, and push the ejector lever forward until the pawl screw can be turned out (from the other side) into the groove in the cam.

Slugs Jump out on Floor

QUESTION: I cannot understand why my slugs jump out on the floor. I have set the pawl backward and forward without result. — T.B.S., Whitingham, Vt.

HARDING: Sorry, you can't fix it that way. Invariably this is the result of a broken or absent buffer spring. On old Linotypes and Intertypes it is on the ejector slide: on new Intertypes, on the ejector lever link; on Linotypes with universal ejector, inside the blade pocket.

Slugs Tip When Delivering

QUESTION: The 12-em slug hangs up on the very tip of the lower knife block liner, and no amount of adjusting seems to help. Could this be due to a welded ejector lever? — A.C.O., Jasper, Ala.

HARDING: As a general principle, polish the slug chute and spring plate with graphite, and the inside surfaces of the side knives.

If an old mold, sometimes the last rib is pretty far from the end and encourages the tip, but this should yield to other measures.

Remove knife block and spring plate. The hook on the lower spring plate lug may be bent, or one or both lugs may be bent or loose. Get new lugs and rivets.

A very common cause is spring plate tension. While the plate is off, see that the flat copper spring is in good shape, and properly caught under the buttons when you replace the plate. To adjust the tension, the best tool is a ¼" rod with a slot in the end and an L handle on the other end. With this you can bend the flat spring while it is on and get any kind of tension — more or less. If the plate is in good shape, you should be able to stop tipping with this.

A rib trimming caught in the chute will hinder ejection.

As a last resort, here's a trick taught me by the representative of one of the Companies: if short slugs appear to move up as they are ejected, try bowing the spring plate to put pressure on both ends of long slugs but less on the top of short slugs. If there is a projection on the lower end of the spring plate, bend it a little to the left.

Intertype Ejector Cannot Be Changed

HARDING: If the ejector locating lever (the lock) cannot be pushed down, see that the machine is in normal position — especially that the disk is not forward. If there is still trouble, look to the adjustment of the screw and lock nut at the back of the ejector lever.

When the lever goes down but the blade won't change, this may be due to the fact the blade has not been changed for some time. Hold the lever down and work on the shifting lever in both directions. It usually gives.

Old Style Ejector Slide

LOOMIS: Many of them are pretty old. Check these items for an overhaul:

See that the buffer spring is operating.

The Ejector Slide Releasing Arm Pins (A-20), four of them, should not be worn so as to allow the blade to sag and knock off the tip of the lower liner. If you install new ones, be sure they go into the holes in the blade. If you have the flat springs off, flatten them out in the ejector blade holes while you tighten the screws.

The Ejector Blade Banking (F-589), a small flat piece, should not be worn much where the blade banks against it. It's easy to replace.

In replacing these small parts, one should in nearly every case put in a new blade also.

Take off the Ejector Blade Guide, just behind the disk, and see that the Pressure Bar, the floating piece, is free and operative. Usually the Pressure Bar Friction, the long brass strip, is badly worn. Replace it, gently tapping the new one into place with a small hammer — the pressure bar being removed from the guide, of course, to enable you to hammer solidly. You may have to round the friction bar a little so the blade won't strike it on the flat side.

Universal Ejector Slide

LOOMIS: These are not difficult either. Take off the plate held by six screws. Note that three screws are shorter and go in the top. Take out the ejector blade links and the various sections of blade. If the links are battered where the controller hits them, replace. If the links are chewed up where the blades fit over them, also replace. If the blades are sprung and bent and wavy, replace. The bottom blade is 4 picas; the others are two except for 13 picas, where you will find a 3-pica piece below and a 1-pica piece above. This blade, set on 12 picas, will make a 12-pica liner look like Galveston after the hurricane.

If you keep old blades and/or old links, put the controller in place and push the blades about one pica through a 30-pica mold. Prop the controller in place with a piece of wood furniture or slugs. File the ends of the blades as a unit, square and straight with the mold. Needless to say, don't file the mold.

If you take this stuff apart, note the Ejector Blade Controller Link Lift Roll (F-1688) which came with the machine. The ejector shifter will work much better if that roll is retained.

If you use the old controller, see that the hole is not enlarged very much, and that the stud at the top is still in place. Ten to one it isn't. It should be there. It is designed to slide down the slots in the ejector slide and keep the controller fully behind the top blade instead of only on the corner.

Now let's put the whole works together. Push the mold slide not quite all the way back — about an inch forward. Get under the pot with a light and pull the ejector slide backward until the slot is at the back. Insert controller, put in screw.

Back up the machine from normal position. Push forward gently on the ejector lever, feeling for the bump of the stud at the top of the controller. Most of the time it will hit on a partition and then go over or under. In this case, open the vise and push the blades on through a 30-pica mold. Measure them. Over or under? Usually under. Now on the Ejector Blade Controller Lever Latch Handle (F-1307) is the latch which fits into notches to set the blade. This is held on with screws and can be moved up or down, moving the controller correspondingly until the stud passes easily into the proper slot. If necessary, the top of the latch can be bent. Then set the indicator rod by the threaded piece at the bottom end.

Improved Controller Link

Now, a word about the controller. If you have trouble on an old machine getting the ejector to push the slug out far enough (and this can happen), you can get an "improved" controller from Lino Parts, with a 1/8" ridge which gives that much additional throw. The long screw should be replaced at the same time.

Intertype Ejector

LOOMIS: This works differently, having a variety of solid blades, one of which is impelled by a master blade. These blades need oiling occasionally or they will freeze up. I drill a hole on the thin cover of the box, near the top, and squirt one squirt of oil about once every six months into the box. If you get too much, it will show up on the slugs.

If a blade gets damaged, you can replace it without taking the box apart. Take off the Ejector Blade Keeper Bar and remove the master blade. With a makeup rule push the damaged blade to the rear. Pull it out. The other blades will stick in place. Slide in the new one, oiled. Hocus, pocus, ems and picas! Easy, too easy.

When Linotype Ejector Sticks

HARDING: If the ejector blade gets stuck in a hollow slug at ejection, you cannot open the vise or move the machine either way.

Release the rear end of the ejector lever link and use the clutch to bring the machine to normal.

Open the vise and pull out the disk. Loosen the liner screws or the Intertype swivel bolts.

Loosen the mold cap and free the ejector.

Push the ejector blade back through the mold with a 6-point reglet.

Now you can hook out the slug with a brass wire with a hook on the end of it.

Do not use the ejector lever handle to pound out stuck slugs. You will damage the ejector blade and eventually the mold – if not sooner. If time is pressing, it is occasionally excusable, but not as a regular thing.

Some m-o's cast a new base in a hollow slug, but this can be very complicated.

When Intertype Blade Jams at Ejection

LOOMIS: There is one situation in connection with stuck slugs that should be gone into. This happens to a certain extent with Linotypes occasionally, but in its more violent forms is more fully exemplified on Intertypes. This is the spot where the operator tries to eject a 12-pica slug with, say, an 18-em ejector blade. A 14-em blade would merely twist the liner and pass through, as a rule,

and a 30-em blade probably would be stopped altogether, but 18 or thereabouts can be very bad. The blade twists the liner but doesn't break it off unless it's 6-point or smaller. The blade comes on through and ejects the slug, then tries to return. But the twisted liner, caught between the mold and the knives, jams against the blade and acts as a wedge. The blade cannot retract, so the master blade either breaks the lugs off of the blade, or it slips out of the blade, or it jams right there.

In this latter situation you have the machine at transfer. You cannot open the vise. You cannot back the machine or move it forward. The ejector blade and lever and connecting link hold it solidly. It is very likely that the heavy pressure on the ejector lever will make it impossible to disconnect the link. This is a good time to go out for coffee.

Turn off the motor. Put in the clutch. Try to disconnect the link to relieve the pressure. If you can't — you can't. With a ¾" socket wrench take off the knife block. Loosen the screws on the mold cap and take it off. Pry off the liner. Push the ejector blade back to the mold and let the machine finish its revolution.

If the blade itself is damaged — which it likely is — you will have to straighten it or put in a new one. Take out the mold slide. Move the master blade to 30 picas. Take the cover off of the ejector blade box. If the blades are dry, take the whole works apart and clean and oil. If they have been oiled recently, or if you are holding up page one on press-day, pull the blade out slowly while you use a knife blade to maintain the space it leaves. You can slide it back in without disassembling the box. Get it lined up with the others, work the master blade back and forth a few times. You're set.

Sometimes the master blade comes clear out. In this case the ejector slide may jam against the column or frame of the machine and hinder movement of the mold slide and of everything else within two blocks. You can't move the mold slide or anything else. In such a case I have had the best luck by using a long brass drift at the rear of the machine to hammer the ejector slide forward just enough to loosen it. It won't take much. To get the master blade back in, if there are no broken or twisted ejector blades in the box, take off the vertical bar that holds the blades in at the rear, and merely slide the master blade in place.

When you get all through, put the cover on the box and put things back together.

Intertype Master Blade Slips out

LOOMIS: When you lower an Intertype vise to second position and pull out the mold slide, *be sure to disconnect and remove* the ejector lever link. Very new Intertypes have a safety device here, but on most of them, if the link is left in and you pull out the mold slide, the master blade slips out, maybe the link itself becomes wedged against the frame, and the boogieman comes down the chimney. It can be *very* complicated.

Why Does Ejector Blade Scare Inside of Mold?

HARDING: This is caused by a sprung ejector blade or section, maladjustment of the mold disk guide support screw, or improper setting of the mold disk locking stud blocks (see *Replacing the Mold Disk Locking Studs and Blocks,* page 136).

Trouble in Ejection Caused by Warped Cap

QUESTION: All our molds work fine except the 10-point 12-em, which starts hanging up when the metal gets to circulating through it. This same mold is all right on 30 picas. — B.A.M.

LOOMIS: The body thickness of the slug is greater on the left end. Since 30-pica slugs come through all right, it may be that your 12-em section of ejector blade is rounded off toward the top. It is also likely that your mold cap has a little warp. This can be checked by a machinist with a plane table and a dial indicator, or send it in to the Company and ask them to check and grind it if necessary.

Slugs Eject With Difficulty

High temperature. Warped caps, especially on recess molds. Poor ejector blades, un-square on the ends. Rounded edges of mold. Accumulating of metal on back of mold.

Polish the inside of the mold with oil and graphite.

Scales of metal around liners that have been in place for a long time, will fatten a slug and make it hard to push through. A too-short ejector blade may be the trouble. Ad figure molds have flat ribs and do not eject as easily as the others.

On old machines it often helps to have a thicker ejector blade, up to the maximum that will go through the mold. But watch those recess molds!

There is also the possibility that the clutch is too weak (see *Starting and Stopping Adjustments,* page 250).

Why Do Slugs Pop or Pound at Ejection?

HARDING: Keep the mold polished with oil and graphite. Linolizing is said to help remarkably, but I have not had opportunity to observe this fully.

This popping appears to result from some peculiar property of the steel in the mold, and not from the usual causes of ejection difficulty.

Sometimes this develops into pounding, which usually indicates the need for mold polishing.

Why Do Slugs Pull Back in Mold?

They cannot pull back far, but they can pull back a little, and get trimmed under type high. Also, if the liners are not firmly fixed, it will pull the liners back a little, and the back knife will shave them. This pulling back occurs at the breakaway. The slugs are tapered .0025" smaller at the bottom to prevent it, and the liners have tips to help. Invariably this occurs when the mouthpiece is cool and the slug does not break away promptly. Keep mold cap screws tight; turn up mouthpiece heat for starting.

Too Much Cracking on Breakaway

QUESTION: Our pot makes too much noise on the breakaway — sometimes a positive crash. Is there any way to relieve this? — T.C.I., Fitchburg, Mass.

HARDING: Get a jeweler's broach for a 1/16" hole and taper the holes a little, larger at the front. This will facilitate breakaway. Usually happens when mouthpiece is run rather cold.

LOOMIS: It is well too to check the pot return cam on the inside of the main driving cam — on the right, looking at it from the back. Sometimes this cam, which is no more than a shoe, is broken, and sometimes the lug on the pot cam lever, which transmits the pot return cam's motion to the mouthpiece, is broken or loose.

A 6/0 taper reamer will do the broaching on the mouthpiece.

Welded Ejector Lever May Interfere With Setting of Ejector Level Pawl

LOOMIS: Due usually to an inexcusably stiff clutch, an ejector lever, heavy and tough as it is, frequently is broken about the middle. This is one of the most common breaks in linecasting circles. When he has it welded, the m-o should note particularly that the welding does not build up the inside of the lever at a point where it will hit the main cam shaft. When this happens, it is impossible to adjust the ejector pawl so the blade will go as far forward as it should. Clearance at this spot normally is very small.

If you have one like that, there is only one remedy: take out the ejector lever and grind it down to its original contour on that side.

CHAPTER XXIII

TRIMMING KNIVES

Setting the Side Knives

EVERETT SHAFFSTALL in *Printing Equipment Engineer:* There are a number of factors to check before attempting to do a thorough job of setting the side knives. Of course these may not be necessary where you are just closing up one end or opening up the other a little, but in any such operation as installing new or sharpened knives, these factors must be considered, and in any situation where there is repeated trouble getting and holding a good trim.

The disk should have just enough room to turn freely. The guide or guides should be set up to it. Excessive looseness, especially in the mold disk hub, will cause a varying trim and also damage to the molds, which will appear as a slight score across the back of a mold 14 picas from the right end, caused by the back knife as the slug is ejected from the opposite mold.

Loose Mold Disk Hub

LOOMIS: On old style (small hub) Linotypes you use a feeler gauge at the back, and cut a brass shim about half the thickness of the indicated play.

On the modern large hub (Linotype), you can take off enough material from the hub by rubbing it on emery cloth laid on a makeup table or stone. Be careful. If you take too much, you will have to shim.

On the Intertype you can remove metal from the back shoulder of the stud. (LOOMIS: For the country m-o, I think a shim might work out better, although a really first grade machine shop man can of course do a good and permanent job. This kind of work has its difficulties, however; turning a couple of thousandths from the end of such a stud, and keeping it even, involves absolute squaring up of the stud in the chuck in the lathe — and this is tricky work.)

Preparations

Mold disk locking studs and blocks must be in good shape to get a good trim. This is essential. (See *Replacing the Mold Disk Locking Studs and Blocks,* page 136.)

Molds should be cleaned. If any metal adheres to the back, remove it. Clean the liners thoroughly.

Put 30-pica liners in all molds. Remove old knives and clean the vise casting. Put on the left-hand knife and insert the pressure spring with the two ends

against the knife. If you have not moved the two knife-adjusting screws, this left-hand knife should be somewhere near the right spot. Try a slug. Then use a slug as a feeler to set the right-hand knife 10 points from the left-hand knife.

Set the left-hand knife so that it does not gouge. It should scrape the slug in streaks evenly all the way across; it should trim off any overhang at the top, but it should not "shave" the slug. This setting is done with the right-hand knife two points open. (LOOMIS: I have trouble when I open the right-hand knife. I generally keep it right up in place, even adjusting it roughly if it gets too far off, because on old machines (not the kind Shaffstall has) which have not been well maintained you must keep your right-hand knife in place or you won't be able to hold the setting.)

A good slug is parallel — the same thickness at both ends and the middle, and not tapered from top to bottom.

Slugs Thinner in the Middle

If 30-pica and two-column slugs are square but the one-column slugs are thinner on the left end, and if all molds are alike, it may be the knife. Use a ¼" square by 3" long stone, held flat against the inside of the right-hand knife, to hone down the surface of the knife for about an inch, being extremely careful not to round the cutting edge. Check frequently.

This trouble also arises from a mold that has been much used on short measure and is actually worn down on that end, or from a warped mold cap.

Usually these two latter causes are present on only one mold, while the other molds are all right. If the base of the mold is worn down, there's not much you can do with it. The cap, whether worn or warped, can be reground by the Company.

To Cure Slugs Tapered From Top to Bottom

Where you have constant trouble with slugs that taper smaller toward the bottom, sometimes it will help to hone a small flat or reverse rake or bevel on the left side of the cutting edge of the right-hand knife. The depth of this bevel should be very slight — the stone being held almost parallel with the knife — and the width of the cut about 1/32", but carried from one end of the knife to the other.

If this does not do the job, then talk to your local grinding machine man. Ask him to lay the knife against a magnetic block with the base (which normally fastens down against the machine) against the vertical surface of the block (toward the rear or front of the grinder), and the cutting edge up. Now we assume the base of the knife is perpendicular with the table of the grinder and with the shaft of the grinding wheel. So we throw it out of perpendicular by dropping a shim. .006" thick and ¼" wide between the knife and the magnetic block, all along the bottom, at the corner diagonally opposite the cutting corner. This of

course throws the knife out of square by .006", which is all you want. Now grind a reverse rake along the edge of the blade, about 1/32" wide. This small cut can be very effective. Needless to say, such things can be done by hand with a hone, but it is easy to get too much angle.

There are times when even these alterations don't work. If the ejector lever has been used constantly over the years to hammer out slugs, the molds may be out of square. These have been repaired, but its value is doubtful.

HARDING: The old narrow-type mold cap end guides warp sometimes, allowing undue opening at the top of the mold and producing excessive body taper. Measure this by measuring the slug between the ribs. Be sure the back of the slug isn't gouged by the left-hand knife. The factory taper is about .0025".

A Minus Reading in Center Portion of 30-Pico Slug

This can often be corrected by honing the negative rake bevel in the area involved.

Knives Should Be of Equal Height

They should be ground in pairs and always equal in height.

Don't Forget the Sector Screws

Remember, when you get the knives parallel on a Linotype, by use of the sector screws you can secure an exact point-size setting for each thickness of slug without affecting parallelism.

Hump at Bottom of Ribs

LOOMIS: This may be caused by several things, but first be sure the hump changes the parallelism of the slug. Measure at the hump and at the top of the slug. Sometimes it comes out just right; other times it doesn't.

It may be caused by knives being too low, requiring the slug to make too big a jump from the mold.

Mold banking blocks may be worn down or gone, depriving the mold of needed steadiness during ejection.

The forward thrust of the mold slide may be away off, allowing the disk to jump forward when the ejector blade hits the slug. Also there may be too much play in the mold slide.

At ejection the disk should come up firmly against the banking blocks and should stay there, not moving until ejection is completed.

HARDING: Sometimes you have only to set the left-hand knife closer to the slug.

Why Does One Mold Trim Perfectly, While Another Does Not?

QUESTION: Our straight-matter mold trims perfectly, while the 10-point is away off on 30 pices. Can you tell us how to fix this? I have to keep the 12-pica slug straight, but I'd like to satisfy the jobman too. — T.S.T., Jennings, La.

LOOMIS: I think so. If you have a consistent difference between two molds, you are in for a mold-shimming job. However, there are some things to check first.

If the disk is much more than .005″ out of true, you may need to replace that. If your mold locking studs or blocks are worn, you will need to replace those. If your vise locking screws, especially the right one, moves the vise as it locks up, likewise. There is the possibility of the knife's getting temperamental on certain molds, but that is fairly remote.

With a single-mold disk, you are all right. The knives can be adjusted to fit. With a two-mold disk it isn't as easy, but still it can be done. With a four-mold disk — tsk, tsk. Quick, Henry, the shims.

Shimming the Molds

LOOMIS: For this job you will need a big screwdriver with a perfect blade for the big mold screws, and a smaller ditto for the mold cap screws. You will need also several sheets of paper, from 9-pound onion skin (or tissue) which will measure about .0015″ to oiled tympan paper which mikes about .006″; 20-pound bond hits about .004″; 16-pound, .003″ or .0035″. But mike them; they vary. 13-pound should hit .002″ or .0025″, but for some reason it often doesn't. Anyway, it's hard to find.

Be sure the backs of the molds are clean.

Cast 30-pica slugs from all molds. Line them up and have a look at the backs only — the flat side. The one with the least trim will be used as a guide, for it is the farthest away — and it is ten times easier to shim than to file pockets, and I don't like to file pockets anyway. I go around with my eyes downcast for a week after a job like that.

Observe the backs at length. Now set the left-hand knife to trim properly the one least trimmed. A proper left-hand knife means it just touches in streaks all the way across, and leaves no overhang of letters at the flat side. You may have to pull in or push out the right-hand knife somewhat as you do this, to avoid extremely uneven pressure on the right — which can make a difference. You needn't mike it; go by the looks of the ribs. The back of the slug should not show any noticeable solid areas of trim; a perfect mold should not show any. But some molds are not perfect and you cannot avoid a little along the top for an inch or two — but no more. When you get it so the streaks are about even all the way across — these are caused by irregularities or tiny defections in the cutting edge of the knife itself — tighten the two bolts — extreme upper and lower

– firmly, and try it again. Set the right-hand knife now. On old molds you will have to set it about .002″ fat, but be sure the liners and mold do not have flakes of metal around them. Newer molds are made a few thousandths undersize to allow for trimming right down to size – .014″ to the point.

Now cast a whole new set of slugs. Assuming your pet is still good, observe the backs of the others. They will now be more gouged than before, and the object is to shim them up between the mold seat and the mold (on the narrow edge) until they are the same. This may take a slight amount of doing and practically unlimited patience.

Let's say a slug is gouged on one end, about 2″ long and about ¼″ down from the top. This would indicate a piece of newsprint under that end (about .003″). I always put oil on the paper so it will stick where it is put. Work on this one until it is right. If unfortunately you find the letters hang over on the other end without trimming, you will then, I am sad to say, have to move in that end of the left-hand knife, and then re-shim the first mold. This does not happen often, but its frequency is quite enough.

Now, having gotten the first mold still farther away, tackle the second one again, and get it as close as you can. It is not necessary to split thousandths.

Take the third one and the fourth. Be sure you put oil on all the strips.

Do not forget that every time you replace a mold you have to go through the routine: push mold to the right; tighten 4, tighten 3; loosen 4, tighten 4; loosen 3, tighten 3. You cannot get a comparable trim otherwise.

When you get all through, your slugs should measure pretty uniform. If the big ones are off a thousandth or two, forget it unless you have unusual work where you use a lot of such slugs in one spot.

Now put in your straight-matter liner in the first mold. (By the way, this should have been the best mold. I hope you read this far before going through the routine.) Here I don't depend on a mike. Only a very experienced machinist can interpret the readings of a mike at top and bottom of every rib – and he misses about half the time. Ribs vary considerably, and you have to think about where the rib is on the slug, what kind of form it will be used in, etc.

Variation in ribs can be eliminated by long, tedious and careful work with a hone on the inner surfaces of the knives, but I doubt that it's worth it. Also, some machinists with extraordinary equipment and experience have honed knives and even molds to make short slugs trim exactly the same as long slugs from the same mold, but this is unbelievably complicated – and you probably will wind up buying a new mold anyway.

Cast twenty straight-matter slugs; let them cool a minute; then mix them up so all the hot ones won't be on one side; split them into two equal piles. All right, so you had one left over; send it to me. Put these two piles end to end, and use your fingernail. They should be even; if there is any question, cast twenty more and try the two piles together; you won't go wrong with this many.

Try the other ends together also. Be sure you are not fooled by a nick in one end where the slug slides down the chute and hits the Galley Slug Buffer—or any other unusual bulge. Sometimes the knife wiper drags across the top and causes a ridge.

Are they off a little? Set the right-hand knife and make them right. *Do not touch the left-hand knife ever again until you replace it or make repairs.*

Now on an Intertype, if you have set your first slug to trim the proper point size, all other slugs will trim their correct point size. On a Linotype they are set individually. Set your knife, say, for 10-point, the 8-point having been the first one set. Open the vise and loosen the set screw that holds the individual point size screw, which is then reached through a hole in the right-hand frame of the knife block This does not affect the parallelism of the knives; it changes only the amount of the opening on that size only.

Why Are Slugs off Their Feet?

QUESTION: Our slugs are straight from end to end, but off their feet. A column bows up in the middle when we lock up.—F.T., Jr., Batesville, Ark.

HARDING in the *Graphic Arts Monthly:* This could result from molds out of square, but in this case it's nothing but slugs trimmed too fat. The ribs on universal molds are tapered the same as the bodies on all molds. You can set them about .002" fat, but these are .005" fat, and when you have that much you will have slugs off their feet.

Sometimes this is caused by an overhang at the top, which means the left-hand knife is not trimming enough.

Knife Trims Fine on All but 6-Point

LOOMIS: This is a puzzler that I ran into in western Minnesota. The answer was: slight wear in the knife block gibs, which were seldom set on 6-point. Eventually there was a hump at the 8-point, and when the knife block went over that it canted the knife. Remedy: Very carefully hone the gibs to smoothness.

Adjusting Linotype Knife Block Gibs

LOOMIS: First see that they are smooth on the sliding surface; oil them. Turn down the two adjusting screws at the top of the knife. Turn down the left one until it just binds the knife and won't allow it to slide back to smaller point-size; then back it off just enough to release the block. Do the same with the right-hand screw. Try the left one again. These seldom need adjustment once they are set.

These gibs should be oiled occasionally. Later blocks have two oil holes, but the older ones do not have them.

To Set Side Knives Without a Micrometer

See *Shimming the Molds,* page 214, the paragraph near the end starting, "Cast twenty straight matter slugs."

Miscellaneous Causes of Bad Trim

Warped mold; vise locking stud or screw loose or worn; metal in the right-hand locking stud block; worn locking stud and blocks; the disk loose on the stud; the tie rod loose at the back; anything that interferes with justification of the line; a warped mold; mold disk guides not bearing properly; worn mold disk stud.

Setting the Back Knife

LOOMIS: Knives are just about my favorite subject, and the back knife the most so. We'll need a new knife for this job.

Take off the old back knife. Clean out the seat. (I assume the mold disk is out far enough for you to get at it.) Set in the new knife. Be sure you have the right one. The Linotype knife point makes an angle of 40° and must be used on Linotypes only, while the Intertype knife is 30° and may be used on either.

Witb the disk pulled out and the guides properly set as described above, all metal cleaned out from behind the disk (spin it to see if it is free), put the new back knife in place. Often you have to lower the screws, for you want the new knife to slide down until it is backed away from the mold.

Now turn the screws up evenly. Use a light. You can use red lead or tissue paper for a test. I use my eyes. When the blade seems to be touching, I try the mold disk carefully. If it goes all the way around without rubbing, well and good. I know then it will trim about .925″.

Now make a cast from each mold, using only capital letters — those unused as much as possible — the last two rows. Let the slugs cool thoroughly by laying them flat side down on tbe magazine. Mike them.

Take the tallest one. (If you have seated the molds as instructed, tbis mold is the one to which you will have to build out the rest, for you cannot push this one in.)

(Correction: Yes, you *can* push it in by peening the surface of the disk against which the mold fits, but this is work for an experienced man. Let's make it easier by building out the others to fit this one.)

Mike this tallest slug on the ends and in the middle. If one end is .925″ and the other .924″, put a cigarette paper under the .924″ end. Always observe the tightening ritual.

(HARDING: Sometimes when a 30-pica slug trims high on the right end only, the mold disk guides are not set close enough to the mold disk.)

Now it comes out even on the ends but it measures .923″ in the middle. That's easy. The screws that hold the knife to the frame are fairly tight – not good and tight. (I hope you ordered new screws with the new knife; the large-headed ones are convenient.) The adjusting screws are 24 threads to the inch. One full revolution would make .041″. Therefore turn the *inside screw* anti-clockwise a little than one fourth of a quarter turn. Take an old screwdriver with steel all the way through. Put the blade in the slot in the knife (that's what it's for) and give it a smart tap down. If the screws are reasonably tight they will hold it down. Now try another slug.

In testing for type-high, it is best to cast three slugs every time, and use the third one. Sometimes the first one or two will pull back a tiny bit. Let them cool to room temperature before measuring them.

Now we've got the tallest one even, and the work begins. Measure the others and shim them out to the first one. Suppose a slug measures .920″ on both ends. Put a sheet of tissue paper clear across the front. Etc., etc., etc. When you get them all alike, turn your screws up a little at a time until you get about .919″ all the way across. .918″ is perfect, but don't go under. .920″ is acceptable. A difference of .002″ cannot be seen on enameled stock on ordinary presses. This I have proved.

I aim at .918″, and accept anything between .918″ and .919″.

Tighten the holding screws carefully and firmly.

Remember that a poor mouthpiece lockup will cause your type-height to be off.

Famous last words: Never again touch the adjusting screws as long as that knife is on. In a small country shop it should last from two to three years. When the slug gets up to about .922″, you will notice it. *Do not under any circumstances try to set up the same knife.* The cutting edge is gone. You will only push the heel of the knife against the disk and scrape off the bottom of the slug, along with a certain amount of the mold. Get a new or sharpened knife. I will not turn up or re-install a knife that has been used. It is time wasted.

EVERETT SHAFFSTALL in *Printing Equipment Engineer:*

Mold disk guides must be set to just contact the front of the disk. The back knife should be removed before this adjustment is made.

Mold slide and vise should be aligned as told in *To Adjust the Mold Disk Lockup,* page 124, by shims.

Pot lockup can affect the height of the slug, the same as lack of alignment between mold slide and vise.

Why Does Metal Gother Under Bock Knife?

QUESTION: Metal gathers on the under side of the back knife and binds the mold. How can this be stopped? — W.B.A., Pitman, N. J.

LOOMIS: Fundamentally this indicates an improper grinding job. There may be other causes, but I don't know them. I never grind a back knife by hand unless it is an absolute emergency. Keep two knives, and when you take one off, send it in promptly for sharpening. If the knife is not ground at the proper angle, or if the bottom surface is unusually rough, metal will adhere. I repeat: have your knives ground professionally.

To Avoid Voriotion in Height

QUESTION: We cannot get a consistent bottom trim on our slugs. They will vary as much as .003". — L.T.M., Chepachet, R. I.

LOOMIS: It sounds to me like a worn mold disk stud. That's the big, short shaft that goes through the middle. On either Linotype old style or Intertype, try feelers in the space at the back end, between the frame and the flange (or the nut) on the shaft. I'll give you a tip. It may look like a lot of space, but divide it by two when you cut your shim. Usually .002" is plenty, but I have used up to .005". Carefully cut a single-piece round shim from unwrinkled shim stock, then carefully smooth out the edges; I have used a makeup rule. Use dividers to mark the right size for both inside and outside diameter. Install it at the back, with plenty of oil. I have had only one of these come out in many years.

When you get it tightened up (all the guides are off, of course) try the disk around and around for bind. Then try it back and forth for shake. There should be no shake and no bind. If there is bind, your shim will soon come out. Now set your guides to just touch the disk at its high point. Some disks will vibrate, and you have to back off the guide a thousandth or so.

First Few Slugs Hove Slick Bottom

HARDING: Many machines do this, the slick bottom disappearing after a number of slugs are cast. This is due to the fact that the slug is slightly pulled back into the mold on the breakaway, which happens sometimes when the parts are cold and the metal solidifies well.

Shorpening Knives ot Home

QUESTION: I am told there is equipment for sharpening side knives at home. Can you tell me where to get this? — S.R.P., Middleboro, Mass.

LOOMAS: Nix. Lay off. You won't sharpen a pair of side knives more than half a dozen times in your life. I see the 1934 catalog still lists a lapping block, but the block and the knife support together now catalog $44.65, and that will

pay for a lot of grinding at $3.50 each. You can get a loaner set of knives from any printers' supply company that grinds these knives. Besides, grinding is tedious and requires considerable technique; also, you will have to grind your lapping block occasionally to maintain a flat surface. It isn't worth it.

The companies grind these by machine and do a better job than can be done by hand. I have known m-o's who would take a back knife over to a grind wheel and grind away a relief, then try to square it up on the side of the wheel. Then they wonder why their back knife is hard to set, or why it gathers metal behind the disk. Grinding by hand is no longer economical.

How Often Do You Sharpen the Knives?

LOOMIS: There are various schools of thought on this. Some say the side knives should be sharpened once a year, but I do not hold with this. Once in five years is plenty, to my notion, and one in ten years on a country machine, unless there are nicks, etc. I doubt very much that the knives, even "dull," offer as much resistance as supposed. This is no reflection on competent men who think otherwise.

As to back knives, in the plant where I have taken care of two machines that get hard use, up to two shifts a day, I find a back knife properly set will last about eighteen months.

I once saw, in a small town in southwestern Minnesota, a machine with side knives and back knife that had been untouched for *eighteen years!* The same operator was there who had been present when the machine was installed. The back knife was pretty well chewed up, but it had only recently begun to give trouble. The side knives we changed on principle.

When Are Side Knives Worn Out?

LOOMIS: When there is too bad a nick in them to be ground out, or when the grinding brings the height of the knife below ¾" on the top end and ⅞" on the bottom end. At this point the knife sits too far from the mold for a dependable trim.

Such old knives can be used, however, by underlaying them with 6-point brass rule – though most service companies refuse to sharpen them until especially requested to.

CHAPTER XXIV

KNIFE WIPER, SLUG LEVER
DAMAGED OR IMPERFECT SLUGS

Knife Wipers

HARDING and LOOMIS: There are many kinds of knife wiper, so we shall content ourselves with general suggestions.

The familiar "downstroke" wiper with its brass lever can always be made to work: usually its trouble comes in a badly worn hole and stud. It may need bending to enable it to clear the clutch bracket. Be sure the roller on the first elevator slide goes into it smoothly and without bumping. The long rod inside should be straight, but it the knives are low from grinding, you may have to bend the top end forward a little. Also you may have to grind a little off the bump at the top of the long rod, to enable the brass wiper to get down to the knives. You may have to twist the brass wiper; if so, twist the top into the knives. The stud that restricts the downward stroke of the rod should be there; otherwise the wiper will drop under the knives occasionally. The wiper must have clearance above a 30-pica slug at ejection.

If an Intertype wiper fails to rise high enough, look for a broken spring. If the first elevator fails to seat, the nuts on the lower end of the rod may be set too high.

After you open the vise on a Linotype, sometimes you leave the knife wiper out of position, and the first elevator comes down on top of it. It will stop.

Keep the screws tight in the knife wiper bracket and the stud. Now you can get narrow lock washers (E-1654) to put under the screw heads. Put a little shellac or stiff job ink on the threads, tighten up on the screws (you got new screws too, didn't you?) and leave overnight.

The screws that hold the Linotype wiper are 4x48. If the holes are stripped, tap them for 6x48.

If you can't make a screw stay in the joint between the short link and the long bar, get the screw E-1466 and the nut to match. They will hold.

The lower mold banking block, which also guides the wiper rod, often is very difficult to keep tight. Re-drill the two screw holes and tap for ¼x24 screws. They will hold. (LOOMIS: I have tapped a ⅜"x24 bolt right in the middle, and that *never* comes loose – but it is rather hard work, and I have had good luck with the ¼" screws.)

Gets a Tinfoil Shaving that Sticks to the Slugs

QUESTION: No matter what we do to the knife wiper, we cannot get rid of this tinfoil stuff. It sticks like glue. — T.K., Hawthorne, Utah.

HARDING in the *Graphic Arts Monthly:* Your trouble is in the left-hand knife, which is trimming too much. It should just remove the overhang at the top of the slug. Fix this and your tinfoil will disappear.

Slug Lever

A slug lever is relatively simple. It should go in far enough to push the last slug out of the way of the next, and it should back out far enough to allow the new slug to fall into place. On the old style Linotype slug lever, keep a little hard oil on the head of the adjusting screw, and oil the dog.

If the first justification cam and roll get badly worn, the roll on the justification rod will not descend far enough to push the slug lever out of the way of the new slug.

On the new Intertype slug lever, actuated by a lever attached to the pot leg, the extreme right position of the slug lever can be adjusted by moving the screw that holds the roller up and down in its slotted hole. The roller requires oiling. So does the slug lever. If you have 24-point slugs, set the lever so it will come out far enough to clear, then on smaller slugs use the filling blocks to keep the slug lever from going in too far; otherwise the smaller slug may fall over.

DAMAGED OR IMPERFECT SLUGS

Caps Are Trimmed off on Top

This is one of the most frequent complaints about slugs, and there are many causes:

First elevator jaws out of alignment, up and down, with the mold.

This defect will show up first on the full-face sizes of aligning Gothic, such as the largest size of 6-point.

The mold may not be level with the jaws from end to end. See *Misalignment of Mats,* etc., page 109.

Faulty setting of the adjusting plate on the mold (which never should be touched).

We assume that the left-hand knife is not set so grotesquely as to gouge off the tops.

Wear in the first elevator connecting link, including eyebolts and nuts, eyebolt pins; loss of strength in the spring in this link.

Butted Slugs Do Not Align

QUESTION: We are setting 50 picas for an insurance form, and as you can see, the type does not align in the middle, although the slugs come out perfectly even. It is a new mold and we have installed new locking studs and blocks. All molds are the same. — S.D.O., Maryville, Mo.

HARDING: It seems rather obvious here that the matter is one of misalignment of the elevator jaws. See above. You might try moving the bottom first elevator gibs a little first.

LOOMIS: This sort of thing often shows up more on bold face when the flipper is used. In that case it generally indicates worn parts in the connecting link, but I have run into old machines where it seemed to me the cast iron of the first elevator lever had lost its original strength, to put it very unscientifically—or the molecular arrangement had undergone degeneration, if you want it said that way — and we could not get the bold face to cast properly without putting a shoe on the first elevator cam. This is a piece of 6-point brass about 6″ long, and is fastened to the cam with flat-head screws. The ends of course are beveled. It is started at the exact point on the cam where the first elevator rises for justification, so that the rise in that cam is 6 points more than it was. I do not care for this type of thing, but it seems to be necessary sometimes, and it seems to work. This can now be bought (in steel) from either Company.

HARDING: Yes, this has to be done. To check, cast a line in bold face on the rail, recast it in light face, then recast it with the flipper. If it suffers cut-off letters only when the flipper is used, check first the connecting link, then put a shoe on the cam. See that the eyebolts on the link are properly adjusted.

Sometimes it is only necessary to install a new adjusting bar in the first elevator front jaw to correct this. If the adjusting bar shows a worn groove on the short measure, replace it.

Sides of Characters Chafed

HARDING: When they appear to be damaged by a spaceband, the trouble may be traced to badly worn studs and stud blocks, misadjusted mold disk support screw.

This may result from sloppy cam rolls and eccentric pin in the mold cam lever. (See *Too Much Forward-and-Back Play in the Mold Slide,* page 126.)

Descenders Nicked Off

HARDING: When lower part of *g, p, q,* and *y* is damaged, check downstroke of the first elevator, forward thrust of the mold disk, mold disk support screw, and locking stud blocks. Reduce downstroke adjustment as much as possible.

If it happens only with the flipper, check the connecting link for wear and adjustment. Here again a shoe may be necessary on the first elevator cam.

It is no secret that certain fonts of mats have been much worse than others in this offense, and almost impossible to correct.

Top End of Slug Damaged or Broken off

LOOMIS: Usually indicates that the knife wiper flag is not being raised high enough.

Lost Letter of Various Words Is Hit

QUESTION: I am sending you a sample slug. This does not occur every time, but about once in twelve lines. — T.S.C., Fredericton, New Brunswick.

LOOMIS: This is an interesting slug. A magnifying glass shows that about half of the last letter of certain words is somehow pressed down several thousandth of an inch, obviously too low to print.

This suggests that the mold disk is breaking away from the mouthpiece pretty hard and actually rebounding against the line, which by this time has spread a little, so that the last letters now hit against the spacebands, causing the damage.

This can be rather difficult. On old machines, be sure the lower mold slide gib is up as far as it should be. Check for excessive play in the mold cam lever, as suggested in the paragraph above. Of course anything that will soften the breakaway will help, but this is hitting in the dark. An oversize pot return cam shoe sometimes will help. See that the justification block goes down far enough to clear the spacebands.

You can get E-2321, Mold Slide Spring Buffer Bracket, Assembled, which will help sometimes, for it cushions the rebound of the disk.

Letter on Right End of Line Is Nicked

HARDING: May be from too deep a downstroke of the first elevator, which delays its rise and allows the mold disk to scrape the slug on the jaw.

This can also be caused by an overly stiff pump stop spring.

Liner Tits Damaged by Universal Ejector

LOOMIS: This usually happens on old style ejectors with solid blades, but can happen on universals. It implies that the right-hand mold disk locking stud is set too high, pulling the mold disk up all it can against the play in various worn parts. See *Replacing the Mold Disk Locking Studs and Blocks,* page 136.

Slug Shows Chilled Face at One End

HARDING: This happens rather often. See that the mouthpiece burner has a double row of holes at each end, that the metal level in the pot is not too low. Particularly refer to *Frosty Face on One End of Small Slug,* page 187.

Check the mouthpiece burner by looking at the flame.

The mouthpiece holes should lie close to the back of the slug, with neither end hole partly plugged. An extra hole drilled between the first and second holes, in the vent, usually helps.

Trouble on Costing Border

HARDING: When recasting border, sometimes there is a little chill in the middle. Likely this happens because the border slide is solid and does not allow any air to escape, as does a line of mats. Turn up mouthpiece heat a little.

Why Do Chorocters Vory in Height?

QUESTION: I am catching the dickens from the pressman because certain letters on a given slug will be low or high. They are not the same letters and not in the same place, and not always the same slug. – F.E.H., Port Huron, Mich.

HARRY G. POTTLE in *Who's Who in the Composing Room*: I have heard that sometimes this is the fault of defective mats, but I have not seen any of them. There are other causes more frequent.

You can easily see the difference in height of such characters by laying a straight-edge across the face of the type and observing it from the side.

Accumulation of metal on the face of the mold will cause this. The cap and body of the mold should be even in front. On rare occasions a warped mold will cause it.

HARDING: Check also for weak or broken pot lever spring; lack of pot's retreat between justifications; loose vise locking stud; forward thrust of mold disk improperly set; a screw sticking out from the mold.

If on bold face only, check clearance in the first elevator jaws with mats on the duplex rail. A bind here will cause trouble.

CHAPTER XXV

THE TRANSFER

First Elevator Pounds When it Seats on Upstroke

By HARRY G. POTTLE in the *Printing Industry:* I suggest you discontinue the liberal application of graphite to the first elevator head, for that will get into the magazine and make trouble.

See that the duplex rail is straight and smooth; clean and graphite it, and put it back; try the levers that operate it and see that it is free.

Raise the first elevator by hand to see if there is a bind. The ends of the duplex rail levers and their opposing blocks should be lubricated with hard oil.

Sometimes mats with distorted toes will stand up too high on the duplex rail.

Are the duplex levers pulling the duplex rail back completely, so mats on the rail are free to drop?

The intermediate bar may be set too far forward and cause too much pressure on the first elevator front jaw.

Mats Spill out at Transfer

Pregunta: Senores: Tenemos una maquina para poner tipos, y hay mucha difficultad ahora con el transporte. Los moldes de cuando en cuando se derraman y se dispersan en el suelo. Nuestra maquina es Linotipo, Numero 5, y tiene cerca de treinte y cinco anos de edad. Esperamos que V. puede responder a nuestra pregunta, y le damos las gracias mas espresivas por el favor que nosotros hace. — D.S., Guadalajara, Jalisco, Mexico.

LOOMIS: Never let it be said that we ignored a yelp for help. This man has a Model 5 about thirty-five years old, and he is distressed because his mats frequently spill out at transfer and are scattered over the floor. It's a big question to take on at such long range, but no more so than some we've already wrangled.

This is not an easy subject, for many things are involved, but it is extremely important, for it affects wear on the combinations of your mats as well as annoyance. Nor is it too difficult when you know what to do. It is worth noting that the *sequence* of tests and adjustments is all-important in alignment of the transfer.

E. B. HARDING in *The Publisher's Auxiliary,* and LOOMIS:

Test the transfer by sliding a line of mats and bands from the first to the second elevator by hand. Hold the mats straight up and down. Note whether

they go across smoothly. There should be no drag except for the very slight friction involved *and* the first elevator jaw spring pawls. For one not accustomed to setting the transfer, it is better to remove these pawls; they can be very confusing.

Note especially the left end of the second elevator bar plate. Does it move up or back or to the front as the mats go over, or does it stand still? It should not move.

The critical point is to the right of the spring pawls. Here the mats start onto the second elevator bar, and for a quarter of an inch are on the bar while still in the jaws. Here they must be loose and free. Using a thick pi mat, see that it is midway in this space, then with your forefinger try pushing it up from beneath. Ideally there should be a tiny bit of free play here. The mat must not be tight. This is the final test of any transfer adjustment, except for actually running the machine.

Now let us assume that you have already adjusted the first elevator's movement up and down, as told in *The Gibs,* page 108. If you have not, you may as well get at it now, for a permanent setting of the transfer cannot be made if you are going to have to change the first elevator gibs again.

Note too the absolute necessity of first elevator jaws that are level — at the same height. With one jaw lower than the other, the mat is twisted, and it is impossible to get a satisfactory setting. It is important too that the jaws not be too far apart; if they are, alignment will be difficult. If they are tight, there will be a drag that is hard to pin down.

Now, with the elevator up, take off the entire first elevator head by removing the three bolts in top. Take the intermediate bar out of the head by removing the two bolts in front. The touchy point of the intermediate bar is the pawl. Drive out the pins and remove the pawl. If it is broken it should be replaced. If good, rub it on emery cloth and graphite. Also rub the slot with folded emery, and then graphite. Replace the pawl. Replace the bar.

Now pull up the second elevator and replace the head, without mats in the first elevator. With no more than slight finger pressure, push the head forward until the intermediate bar is against the first elevator front jaw. Tighten the head. Set the screws in the back.

A word about this intermediate bar. If you find later that the first elevator seems to be rubbing a nice shiny strip along the corner of the bar, back it up just a little. It is not necessary that they have such hard contact.

This is the only forward-and-back adjustment of the intermediate bar. The two front bolts are for sidewise movement and vertical setting.

Lock the spaceband pawl and let down the second elevator again. See that there is space between the end of the intermediate bar and the end of the second elevator bar. There must be freedom for the intermediate bar pawl to move up and down, but not over 1/32".

You may set the right end of the intermediate bar for height. The bottom of the pawl, in its highest position, should be exactly even with the bottom of the second elevator bar. You can adjust this by the screw in the top of the head, loosening and tightening the two front bolts when you want to move the bar. Now you can turn the machine a little forward, until the first elevator drops a couple of inches, and lay two 10-pica slugs across the top of the first elevator jaws. Move the machine slowly back, using the slugs to get the left end of the intermediate bar level with the right end. Now, if your space between intermediate bar and second elevator bar is still correct, we shall proceed.

The next move is to set the duplex rail lever blocks. Loosen the two screws in the top of the transfer head, and push in the plate holding the blocks until both ends of the duplex rail are completely in the clear to allow raised mats to drop for transfer; tighten the screws.

We now have the first elevator properly adjusted in the transfer position except for height. Let's get to work on the second elevator.

We assume for the moment that the second elevator is in good shape; this includes the bar, the bar plate, and the bar link — all of which are subject to wear, and all of which affect the transfer considerably. (See *Repairing the Second Elevator,* page 235).

The first item is the inside width of the transfer channel. (LOOMIS: Long ago I made a .780″ gauge for this. I don't know where I got this measurement, but it is very close to perfect.) If the channel is too narrow or too wide, it can be adjusted. Loosen the three screws that hold the front plate and put a piece of newsprint above or below the left-hand screw, according to whether the channel needs widening or narrowing. Do this until you get it. *Do not make any adjustments on the transfer channel until this is done.*

With the spaceband pawl locked and the second elevator seated (the second elevator cam roll should be free of the cam at this point), observe first the front-to-back alignment of the bar with mats in the first elevator. A second elevator bar plate that is badly worn where it hits the post, can cause endless difficulty here.

On new machines (both Linotype and Intertype) you can control the forward-to-back position by two screws which adjust a plate in the post. Note that the second elevator resists being twisted, so both sides of the adjusting plate should be even.

This adjustment is first made with a good pi mat in the first elevator, the second elevator down in place, and a piece of white paper in the transfer channel just to the left of the spaceband box. Hold a light to shine on the paper — not too close, or it will blind you — and get your eye down on a level with the second elevator bar, out at the left, and sight. This is a good test but has limitations, for after a while you can't see straight any more. At other times you may think you have it lined up, only to find that it won't work. But the thing now is to align it front-to-back, and usually this ends up with the intermediate bar pawl in the center of the second elevator bar — but not always.

A perfect lineup here will show the teeth of the mats as a series of black

triangular teeth fitting into an opposite series of the same, but with a tiny amount of white space everywhere between the two. This optimum condition is hard to attain. Most often, perhaps, it is complicated by unevenness of the first elevator jaws. But we are now trying only for front-to-back. Height adjustment will come next.

Front-to-back adjustment on old machines cannot be attained by adjusting the post, for there is no such adjustment. The entire transfer channel must be moved; that is why we have already adjusted the channel at a width of .780". Now the transfer plates, front and back, must be treated as a single unit. If the second elevator needs moving forward or back, as it usually does, it must be done with shims behind the left-hand screw (not the one we used before) (to move the second elevator forward) or by filing off the boss behind that screw (to move the elevator backward). The right end is not changed, for it has to align with the spaceband box.

Now we'll take the vertical alignment of the two elevators. This is simple. First be sure the First Elevator Slide Stop at the bottom of the first elevator, which holds the adjusting screw, is firmly held to the first elevator. On occasion the first elevator casting becomes cracked or the bolt comes loose. Clean out all lead chips and dirt from around the adjusting screw. Now, with the elevator up and the paper in place, turn the screw until you secure the ideal white space between the teeth of the test mat and the teeth of the second elevator bar. When this adjustment is final, tighten the lock nut. Now give the whole thing the test mentioned above — transfer mats by hand, and set one pi mat on the end of the first elevator, just on the second elevator bar, and tap it upward with the forefinger to see that it is free. If it is, finish tightening the lock nut, holding the adjusting screw head carefully to avoid moving it. Put the first elevator jaw spring pawls back in place.

In actual practice, these two adjustments — front-to-back and vertical — are made simultaneously and intermittently.

Transfer three long lines by hand. They should go over very easily — no drag.

Run a number of lines through, including spacebands and plenty of capitals. Listen for the rattle that indicates misalignment; this is not the same as the sound that comes from stiff jaw spring pawls, although they are similar. Watch closely for any movement of the second elevator bar plate during transfer. It should not move.

Finally, holding the spaceband pawl, try a full 30-pica line, letting the transfer finger do the transferring. The mats should go smoothly, with no apparent obstruction but the spring pawls.

Height of Intermediate Bar

Loomis: This is a great fooler. I like to give it a final test this way: run up a 30-pica line and do not let it transfer. Loosen slightly the holding screws of the intermediate bar, and ascertain that the bar drops slightly to the mats. If it does,

pusb it back up and tighten. Sometimes the mats' teeth rub on this bar, and that is not good. I like from .005″ to .010″ play here.

Transfer Releasing Lever

When the second elevator seats, the long screw that goes through a lug just behind the second elevator pushes down the releasing lever, raising the left end of the lever to allow the transfer finger to move to the right. The left end of the lever should clear by 1/32″.

Intertype Transfer Safety Latch

HARDING: This is an additional lock on Intertypes to prevent transfer when recasting raised lines.

Transfer Slide and Finger

LOOMIS: Let's start with the link, tbat narrow piece about 10″ long; it has two holes in one end; use the inside one. When the holes become badly worn, replace the link. It is attached to the transfer slide by a screw that often works out – nearly always so as to project into a hole at the back of the face plate and stop the machine. When the screw threads in the transfer slide become too worn, re-tap for 8x32 and put in a spaceband pawl lifting screw, sawing off what is left over.

The finger itself should be straight, both sides even and square with the world. The screws that hold it are almost the same as those tbat hold the knife wiper (commonly called knife wiper flag). If the threads become beaten, you can re-tap for 6x48 or 8x32, but you will always have to countersink the finger a little to keep the screw heads from projecting. It's easier to get a new slide.

The finger should not bind on the intermediate bar, on the first elevator jaws, or on the second elevator bar. On old machines it is sometimes necessary to put a fancy kink in the finger to keep it from rubbing on the back jaw. Just below the screws, bend it forward at about a 45° angle; then immediately bend it back just below the first bend, so the net result is to move the finger forward about 4 points. This usually does it. You won't need more.

Transfer Channel Friction Spring

While often absent, this is an important part on most machines. Adjust it so that it bulges out slightly to create a drag against tbe bands and keep them from swinging.

Leathers in the Transfer Channel

Narrow strips of leather cut from an old main drive belt, fitted snugly into the channels, and tamped down, will often clear up trouble with transfer of spacebands. But if you get them too thick, they will push up the spaceband wedges against the second elevator bar and stall the machine.

Spaceband Pawl

LOOMIS: The lever often has a lot of play down at the shaft. Tighten the set screw firmly at the bottom. See that the center bar of the pawl is not worn out; that the hinge pin is not worn down; that the spring is strong enough to pull the spacebands but no stronger. The tips of the pawl should go about ⅛" below the ears of a new spaceband; there is a slotless screw, B-246 (why slotless, I never have been able to understand), which can be used to adjust this height; you grind off the bottom of the screw — but if this turns out to be necessary, you'd better consider investment in a new pawl. Loosen the screw that holds the hinge pin in place; let the pawl go over into the channel and let it center itself there; then tighten.

Why Does the Transfer Finger Hit a 30-Pica Line?

LOOMIS: The transfer finger on old machines should have 5 9/16" between it and the transfer channel; on later machines it is 5⅝". Cut a piece of reglet 5-11/16". Corral an assistant. Have him (or her, if you're lucky) hold the spaceband pawl to the right until the transfer finger allows the reglet to go in. You are behind the machine, loosening the two ¾" bolts with a thin end-wrench. As she holds the pawl, you tap the arm of the lever against the cam, and tighten. Chances are the finger will come about right, with that 1/16" allowance. But never mind; you may have to do it several times. Just get the 5⅝"; then you take your assistant out and buy her a coke or a cup of coffee.

Why Won't a 30-Pica Line Transfer?

LOOMIS: More trouble with 30 picas. (What would you do with 42?) Anyway, this happens because that same finger does not travel far enough to the right. Here's the way I set that: Lock the spaceband pawl and let the machine come to a safety stop. Push in the clutch. Release the spaceband pawl and let the transfer finger come in. Now in most transfer fingers there is a ⅛" deep cut on the right edge — as far as I know for this purpose only. The bottom of that cut should be even with the end of the first elevator jaws, which would bring the last mat outside of the jaws and free to be lifted. If this mat is left within the first elevator jaws, there's gonna be trouble.

Now to set it. I get a small end wrench with a ½" opening — the S wrench you use on the pot leg nuts is a natural — and lie on your right side back of the machine. Reach up under and around the main drive shaft, locate the nut on the safety pawl that locks the adjustment screw, and loosen same. Now generally the screw will turn with your fingers. If not, you can work it with a small ratchet screwdriver, or you can crawl out of the machine and turn it over until you can reach it with a straight screwdriver — though you won't find this much easier.

This is the clumsiest operation I know of, but I have tried for thirty-five years without improving it.

Turn the screw in or out and find which way produces the proper movement of the finger; keep at it until you get it right. If your assistant is still there, it will be a lot easier on your knee-joints if you will show her what you are trying to achieve, and have her tell you when you get the finger right. Then she can hold the spaceband pawl hard to the left while you tighten the lock nut (which usually keeps the screw from moving).

A 30-Pica Line Goes up but It Bangs

LOOMIS: This usually means the finger is coming too far to the right and binding against the mats as the second elevator rises. See the adjustment above.

Transfer Finger Does Not Push Bands Under the Pawl

LOOMIS: This also is an adjustment of the transfer finger – but this one is a cinch. There is a long screw in the transfer slide behind the finger which banks on the brass buffer in the spaceband pawl. This screw should be set so the bottom of the cut in the finger comes even with the inside edge of the two pawls that pull the bands. There should be a couple of felt washers behind the brass buffer.

Why Don't the Bands Go All the Way Into the Box?

LOOMIS: This is an adjustment of the turnbuckle, one of my favorites, because you can make it sitting in your chair. With a 10-penny nail reach under the assembling elevator. The turnbuckle is straight behind the bottom of the assembling elevator. Put the nail in the hole and turn. You can see the spaceband pawl move either left or right. Set it so the points come 1/8" to the right of the point where the incline starts in the points in the spaceband box rails. If there is so much play you are in doubt, hold the pawl to the left as you make this.

Why Do Spacebands Twist in the Channel?

HARDING: Often this comes from too wide a channel. Check the .780" width. It may result from a worn-out spaceband pawl that "rides" the bands. It may also be badly worn bands. It may come from bands' swinging in the channel (they should be carefree!). It may be badly worn channels.

Why Are Bands Left in the Channel?

HARDING: A weak or missing spaceband pawl spring is the most common reason. Ears of bands too narrow, or points on spaceband pawl too short, or pawl riding too high. Any obstruction to the path of the bands; this may happen particularly at the spot where the spaceband box rails fit into the milled-out spots on the channels. They must fit back snugly, and must offer no obstruction on the top edge.

(Incidentally, I have always used .785" as the distance between the channels.)

30-Pico Lines Catch in First Elevator Jaws, Though the Tronsfer Finger is Correctly Set

HARDING: This can happen from "spring back," a spreading of a very full line as the second elevator starts up. We can take steps.

On the safety pawl in back of newer machines is a screw in the outer edge; set this to prevent the pawl being driven more than 1/64″ off the stopping pawl.

There is a small pawl on the right end of the second elevator bar. Grind one-third of its width off the left side, to give the mats a little more room. (If you go too far with this, the mats then will strike the bottom of the distributor box or distributor box bar.)

See that the spaceband friction spring is in place.

14-point Bold Face Will Not Tronsfer

QUESTION: I have been on a machine for forty-three years and thought I knew most of the answers, but this is one I can't fathom: Our 14-point works fine in every way — except it won't transfer on the bold face. I can see nothing wrong, but when the mats are on the duplex rail they consistently jam at the transfer. They do not do this if the flipper is used. — T.F.P., Millinocket, Me.

LOOMIS: If it makes you feel better, you aren't the first one who has labored over this. Hardly less than twenty years ago I ran into it. The answer is this: 14-point, or at least certain faces, will not transfer on older machines when in the raised position, for the punched die in the mat catches on the intermediate bar. There is no answer that I know of, except to use the flipper, or release the mats by hand before they go up, if necessary to use a mixed line. It is interesting to note that there are some machines that do not suffer from this difficulty. Perhaps a maladjustment of the intermediate bar will cure it — but that may lead to other troubles.

Tronsfer Chonnel Stop Powl for Mots

LOOMIS: The Intertype, lacking a stop pawl on the right end of the second elevator bar, uses a steel plate in the transfer channel to keep the mats from going too far to the right. This can be applied to a Linotype. There seem to be occasions where there is difficulty with the usual stopping pawl and you can't get anywhere with it. Use an assembling elevator fiber buffer. Set it on top of the ridge in the back plate, with the left edge 5 3/16″ from the left edge of the transfer channel. I have found this little device 100% effective. Thin it down so bands will pass.

CHAPTER XXVI

SECOND ELEVATOR AND DISTRIBUTOR SHIFTER

Adjusting the Second Elevator

QUESTION: The second elevator does not always seat properly. Can you tell us how to adjust it? — W.T.M., Seagrave, Tex.

HARDING: The Book gives this adjustment: when the second elevator is in transfer position, adjust so that the cam roll is free from the cam.

LOOMIS: I have worked out what I think is a more reliable adjustment. Do this at the distributor box. Tighten the adjusting screw until the second elevator starts down, then back up until it is firmly seated.

There is also another adjustment — not, as far as I have found, mentioned in The Book. If the second elevator does not come up centered on the second elevator guide, back up the machine and have somebody hold the second elevator over rather hard in the direction it should go while you tap it solidly with a 4-ounce hammer on the opposite side. (It can be done on the same side, but I have better luck the other way.) It doesn't take as much tapping as you might think. You can thus "bend" the second elevator arm and make it center exactly on the guide.

Lubricating the Second Elevator

HARDING: Graphite the parts and oil sparingly the hinge pins (two).

LOOMIS: That is the accepted way, but in the country I think hard oil is better because it lasts longer. I apply a thin film of oil to the guide post at transfer, to the guide at the distributor box, and to the top of the bar plate.

Dismantling the Second Elevator

HARDING: Disconnect the long spring, loosen the short set screw that holds the hinge pin — or cotter pin, as may be. Push out the hinge pin and take the elevator to the bench. Remove the two screws from the top of the bar plate, gently pry the bar loose from the plate, and with long nose pliers push out the pin to the right.

Repairing the Secand Elevatar

LOOMIS: When the bar has nicks in it, they can be dressed out with a small three-cornered file. If the bar has been striking bands left in the transfer, it's time for a new bar.

If the second elevator bar link (a somewhat square framework) has the holes in the legs badly worn, you will need a new one. There are different types of bar link, and they are not interchangeable; get the right one for your machine. If the bar plate is badly worn either where it contacts the transfer guide post or where the spaceband pawl rides up on top of it, replace.

I'm sorry to say that replacing parts of the second elevator is not as simple as it seems. I know a case where a bar plate was replaced and resulted in ultimate damage of $156 before the machine was back in order — and not through any carelessness of the m-o. These second elevators are more tricky than they look.

Put on the new parts. Be sure the pawl is installed in the new bar as in the old — the slightly hooked part down and at the back, the plunger behind it, the spring in front.

With a new second elevator bar plate, the forward-and-back position of the second elevator must be adjusted, of course, at transfer position, but the touchy work comes at the distributor box. Here the bar must align with the distributor box bar, front to back. This is best tested by feeling with the fore-finger. There should be no rattle of the mats as they go across. After installation of a new bar plate, usually the bar is too far forward. I usually file this on the back edge and on the bevel until it fits. Also it is well to note whether the extension at the top of the distributor box bar fits into the opening in the second elevator bar. Occasionally these are tight, and I usually thin down the top of the second elevator bar to bring smoothness. Tightness will prevent consistent seating.

Be sure the screws in the top of the bar plate do not project. These (BB-138) have to be exactly the right length (½") or there'll be trouble.

Space between the second elevator bar and the distributor box bar should be slight — just enough to prevent friction. The guide usually is doweled, but the bolt holes are large enough to permit readjustment if you drive out the pins.

Second Elevatar Starting Spring

LOOMIS: This spring, low and just inside the first elevator cam, breaks often. The Company is trying to develop one that won't break, but you will have to replace it occasionally, and should have an extra one on hand always. It is most easily replaced when the elevator is at transfer.

Secand Elevatar Jiggles

LOOMIS: This usually results from one or both of two things: broken starting spring or rough or dry second elevator shaft. Try penetrating oil. Sometimes the end of the shaft has been boogered up by a pipe wrench. Swearing doesn't help. Smooth it with emery cloth. Dry cam roll or one with flat spots.

Like many other things, this *can* be mysterious. There is a certain machine in Minneapolis, now about fifteen years old, that was installed brand new by a competent factory man. As soon as he left, the second elevator began to jiggle on the way down. A number of Twin City machinists tried their hand without result. Two more men came from the factory. No dice. Finally the dean of the factory men came out. He looked it over, examined the reports, and ordered a bunch of new parts, including second elevator and shaft. He said he didn't know what was the matter, but that would fix it. It did.

Difficulty in Transfer Caused by Secand Elevator Bar Link

QUESTION: Our Model B Intertype is giving trouble on the transfer. The right end of the second elevator bar is pushed toward the back of the machine when a long line goes over, though the left end is lined up. We have installed new parts. — T.C.T., Murphysboro, Ill.

LOOMIS: I rather think you have a bar link (the squarish frame) with one leg bent out of line. This could also be the wrong bar link. Bar links for Intertype and Linotype are not freely interchangeable, and usually require some filing for clearance with the bar plate.

"Breaking" the Bar

It is sometimes necessary to "break" a new second elevator bar by filing the left end to a slight taper with a jeweler's three-cornered file. This should be done judiciously, giving each groove a light touch. On old machines this sometimes is a life-saver.

Putting an Extra Spring an Secand Elevatar

LOOMIS: This comes on many machines to minimize swinging of the second elevator on the way up, and consequent occasional fouling up on the distributor bar.

On most bar plates there is a hole just to the left of the bar link, in the back edge of the plate. Screw a 4x48 spring hook in there. Now at the top corner of the link, drill and tap a 4x48 (or 8x32) hole and screw in another spring hook; then install a spring just strong enough to hold the second elevator steady on the way up. Keyrod springs have been used for this, and are usually about right, but sometimes a stronger spring is required.

The Distributor Shifter

LOOMIS: This is not complicated but does require certain attention. The slide should be graphited when the machine is oiled. There should be a stop screw at the left to prevent pinched finger, and a stop screw at the right to stop the Distributor Shifter Slide Buffer (G-2845) just short of touching the matrix lift. The best way to adjust this usually is by putting very narrow washers inside the cotter pin. They must be narrow, and the cotter pin must be unobtrusive, or the thing will bind in the box. The buffer spring should be positive but not as strong as the plunger spring — which it often is. It is supposed to give. The buffer itself must ride up close to the distributor box bar but not touch it; it must be centered in the box and not touch either side; and it must be square up and down. The location of the buffer can be attained by judicious bending of the arm on the shifter slide. Oil the screws (one drop) that connect the link to the long lever that actuates the shifter.

CHAPTER XXVII

THE DISTRIBUTOR BOX

Rebuilding the Distributor Box

LOOMIS: This is not too involved, but it must be done carefully. First take off the box.

Let's look at the tilting rails, at the lower right corner of the box as you look at it. These are supposed to move freely up and down. The shoulder screws should be taken out, cleaned, and graphited. If the rails are worn, replace them.

Now about the lower rails at the lift end of the box. Replace those if the small surfaces against which the matrix toes impinge are worn.

Replace the upper rails likewise, and also if one of them has a groove in the middle of the inclined portion, or a narrow groove all the way up. Install these always in pairs — never one at a time. Avoid the long (slow) lift on two-pitch screws. That requires a short (quick) lift; the short lift (steeper angle) will work on old style screws, but not vice versa.

How about the distributor box bar? If it is boogered up on the outer end, either smooth it out with a three-cornered file or replace it. The outer end is to be free to move a little up and down for alignment with the second elevator.

Watch out also for the bars with long bar points. Thin mats may twist in these. Unless you have mats over 14-point, use the short bar point.

The bar point, if broken, should be replaced.

I generally replace the Distributor Box Matrix Lift Lever Hinge Pin (G-100) on principle, and also the hub (G-90).

The Matrix Lift Lever (G-96) and the Matrix Lift Cam Lever (G-435) should be replaced if the hinge pin holes are sloppy. When these are put together with the hinge pin and the hub, all must work very freely. They do not always do so without some dinging.

The Matrix Lift Cam Roll (G-101) may as well be replaced also.

The Font Distinguisher Block, whichever one you have, usually has a flat side and needs replacement. The Matrix Lift is usually worn, and also the screw for it. I always graphite this screw, and it can be oiled successfully and save much wear.

If you have slow distributor screws, you may well use the mat lift and block that separate big mats by one space. These are G-2364 and G-1517, and the odd-headed screw can be adjusted to separate mats of whatever thickness you wish (usually quads of about 10-point.)

The font distinguisher calls for a look. This is formed of two parts that screw together, with a flat spot on one screw which holds the font distinguisher (a tiny piece) upright. The old style is adjusted by screwing in and out. The automatic ones must slide freely under the tension of the spring.

Adjustment of the Distributor Box

Loomis: Now to make it work.

Put a thick pi mat in the box and hold it flat against the four points on the rails. The four prongs on the box should be bent in to just clear the toes and ears of a new mat. Then bring the mat out onto the flat places at the very ends of the rails and see how much play there is. There should be about .003″ on each side. Much more will invite twisting. Sight down the rails and see that you don't bend one more than the other.

Now you will need a small square to lay across the flat places on the ends of the rails and see if they are level. Some machinists speak of tapping these rails up or down to level them, but I have had poor luck at this. The pins fit too tightly, and I generally wind up grinding one off a little – which in itself is plenty tricky, as you will find if you try it. Nevertheless, these rails must be the same height. Smooth with fine emery paper.

Now back to the bar point. Take the thinnest mat (a thin space marked .0277) and put two of them in the box together. Be certain that the bar point will hold back the second mat. If not, you can peen it out. You can also break it if you don't hold it perfectly flat on something solid. The bar point must allow one mat of any thickness to go up; therefore it must be exactly centered in the slot in the mat; if it is too long, file it off carefully. If too short, peen it out.

Now for the narrow flat spring in the front rail. This should be bent out a little, should be free to move in and out of the slot, and should hold a mat against the four points of the rails even while the shifter is withdrawn. I have tried to make a small backward bend in the end of this spring so mats could be backed up past it, but I have gotten into trouble, because the bent-back end of the spring, in a nice tight box, will interfere with passage of mats, for it holds the bulge out too far. Therefore it is safest to keep a straight bend and not try to back mats into the box. At least, Milton Anderson does it this way and it seems to be satisfactory.

The mat lift should be positioned by the block so the shelf just about fully goes under each mat, and no more. You do not want the top to go under. Also you do not want the hold to be so small that the mat will slide off. The perfect adjustment is the width of the thin space (.0277″), and usually the shelf is that wide. The spring on the mat lift should be soft but firm. Intertype springs here are customarily stronger than Linotype.

Fitting of the Distributor Box to the Machine

Now let's try the box on the machine. But first let's do some checking on the big distributor bar. The distance between the top of the brass strip on the distributor bar and the machine frame should be 37/64" (Harding's measurement). If this is about right, you can set the box.

Notice that there are three very narrow lugs along the back side of the box at the top (the front side as you generally look at it). These position the box in relation to the distributor bar — which adjustment is important. Try the box in place, pushing it up before tightening the screw. Then run a pi mat out onto the flat places at the ends of the box rails. Near the end, the mats have engaged the teeth of the distributor bar while the ears are still on the rails.

This is the point that counts. You should be able to push up the mat with your finger and see it rise freely about .002" or .003" — just enough to be completely clear.

If there is too much space, the mat will jump a little as it engages the distributor bar. In this case, notice again the three very narrow shelves along the top of the box on the back side. These position the box against the frame if you push up as you tighten the screw. Now the box needs to go higher so you will have to file a little off the left lug (as you face the box) and half as much off the center lug. Make it right.

But suppose the mat is tight between the rails and the bar. You can peen the cast iron shelf a little, or you can try copper and brass thin-space shims, or in extreme cases you can tap the left-hand lug and put an adjusting screw in it (this seldom happens, but it happens).

When you get the height of the rails exactly right — and test often — try the box again and see if the thing is tight in place. Most likely it will move up and down. But if you have pushed it up firmly every time you have replaced it, the rest is simple. (If you have not, you have the job to do over again.)

The box may move up and down on the pins (the two very short studs in the upper part of the box). If it wiggles here, it shouldn't. The pins should hold it tight. Turn them half-way around and try them again. Perhaps this time you have to tighten the screw hard to force the pins into the groove in which they fit. You will have to file a little off the side of the pins.

The general idea is to fit the box in here so that it can go in place only one way. Then you don't have to worry about a relief operator failing to put the box back the way you do.

There are now two more adjustments — one easy, one not as easy.

Let's take the easy one first. This is the mat lift. My own preference is to adjust the mat lift at the bottom of its stroke. Hold a mat in tightly. With the lift down, adjust the headless 3/8" screw in the cam lift lever so the lift goes under the mat, and about a point more. Now turn the distributor screw until the mat

lift is at its height. The ear of the mat should clear the rail by 1/32" to 1/16". Some machinists do not approve this 1/16" measurement, but I have found machines where less meant the mat lift had to go too low at the bottom of its stroke.

Incidentally, if you run into a worn mat lift block that allows the mat lift to extend so far into the box that the very top of the lift picks up a mat, so that the lift tries to pick up two thin mats, often you can fix it by beveling and rounding the surface just above the shelf of the mat lift, so that even though the mat lift extends too far into the box, the top part of the lift slides up over a mat.

Now we have only the tough one left — and it isn't tough; it just takes patience.

With an extension light in your right hand, several mats in the box, and the machine at normal, turn the screws, watching very closely to see that each mat, as it is lifted, comes up just behind the screw thread ahead of it. "Just behind" means about two points. If it does not, drive out the taper pin that holds the cam on the end of the back screw. You will find a threaded hole in the thin part of the cam, which will take an 8x32 screw with just about three or four threads. An Allen head set screw, 1/8" long, with the point ground a little flat, is ideal. A longer screw will hit on the frame of the machine. Put the screw in place and put the cam on firmly. Set it so the mat will clear the screw in front by that two points, and *fasten it there with the screw.* This is essential; if you don't, it will slip. Nor will the screw alone hold it; I find this out to my embarrassment about twenty years ago. Now pick out a fresh spot; drill and ream with a taper reamer of any size from 3/0 up to 0. Try it again. If the distance is still there, you are a machinist.

William J. Butler in the *Printing Equipment Engineer:* This is a rather simple unit, but it needs to be kept in good condition.

It is well to check the adjusting bolt at the bottom of the second elevator lever before starting work on the distributor box. As this bolt should be free at transfer, it should also be loose at normal position.

The shelf in the matrix lift must be square and sharp.

Binding between the edges of the matrix lift and the lower rails is usually caused by wear between the matrix lift lever and its hinge pin screw.

Lack of oil on the matrix lift lever cam roll may cause it to wear elliptically, which will result in a varying upward stroke of the lift.

In timing the lift cam on the end of the back distributor screw, remember that just before the mat clears the shoulders of the rails there should be .025" space between the upper edge of the mat and the screw edge just ahead of it.

The box rails should be level, straight, and parallel.

If trouble is encountered getting new rails to fit on old dowel pins, use a 4/0 taper reamer in a tap wrench. Start it in the side of the rail which the dowel pin will enter, and open the hole just enough to slip it on.

The narrow flat spring in the front rail should hold a matrix with its ears and toes against the four rails even while the shifter is withdrawn. Be sure the spring works in and out of its slot freely. You can bend it up or down a little — but be careful. It is best to have a new one on hand with rivets.

Matrices Bend on Upper Ears

HARDING: May be caused by a worn bar point that lets two thin mats go up together and bind on each other, getting caught by the screw; upper box rails worn on the vertical surfaces, with the same result; mat lift shelf may be rounded so it slips off when half-way up; upper rails deeply dented, so the ears become bound; the rear screw may have latch play, permitting the screw to sag away and drive the mat by only a very small corner (the screw should be set .005" from the distributor bar); screws may have deep grooves worn in where they first contact the matrix ears, and occasionally a matrix becomes caught in the groove. Such old screws can be welded (no brass) and dressed down or turned down by a skilled machinist.

Mat Lift Foils to Pick up Last Mat

HARDING: Be sure, by patient trial, there is no bind in the box to interfere with mat travel.

Sometimes the machine stops too soon, with the distributor not all the way in. Turn out a half turn on the automatic stopping lever adjusting screw (E-204 or W-425) down below.

There may be a washer on the left end of the distributor shifter buffer that keeps it from going all the way in; or the wrong screw in the shifter slide would do the same thing.

How to Remove the Bar Paint

HARDING: Emery the end of the bar to locate the pins. You cannot buy a punch small enough. Take a 1/16" or Size A Starrett punch and grind the end a little smaller — just a little — on the end. Or buy a nail set with a 1/32" point. Then you can start the pins, which are 1/16".

Mats Fail to Feed to the Screws

HARDING: There may be a wrong font or a mat turned backward, or a mat with bent ear or toe; the shifter may have been locked out and forgotten; the lift misadjusted; the bar point bent to one side.

To Get a Wrong Font or Turned Mat out of the Box

Push it backward with a piece of 6-point reglet.

CHAPTER XXVIII

THE DISTRIBUTOR

Stopping Bar Type Distributor

HARDING: This type of distributor was used on early Linotypes and is still used on Intertypes – even the big mixers. It is a simple mechanism. Most stops on this type come under one of the following heads:

1. Damaged mats.
2. Bent channel entrance partitions, either upper or lower.

There are many other causes, but these are the most frequent.

See that the *upper* parts of channel entrance partitions are in line with their fixed parts. The best way to align the *lower* ends is to climb up on top of the magazine with a light and a pair of long-nose pliers, and bend each partition to center over its equivalent partition in the magazine. The partitions should be straight up and down (from top to bottom of the magazine). Most of the partitions on old Linotypes, from lower case *e* to figure 0, are crimped except *m* and *w* and the em quads. The caps are usually all lugged partitions.

The stopping bar must be perfectly free in its three brackets. It must move with a partition, and immediately return. Lack of freedom here can cause trouble. So can too strong a spring on this bar.

The stopping bar may become sluggish through dirt, bent brackets, dowel pin lost from brackets, or nails used in place of the pins that go through the stopping bar.

The stopping bar should overlap the stopping bar plate, at the left, 1/16".

The Mats Must Clear the Partitions

Run in all your lower case *o*'s, *n*'s, and *h*'s. Throw off the belt and try them by hand, slowly. They should clear their partitions. Examine the partition in relation to those around it and see that it is properly spaced.

The mats should barely clear the partitions.

(LOOMIS: I have a little different idea about this. I have fixed a lot of machines in the country and have gotten into trouble over a close adjustment here, because often the distributor bar is worn and some mats drop off earlier than others. If you find one or two mats that drop earlier than others in the same channel, you can make scrap brass out of them, but unless you try every channel on the machine – and this takes a lot of time – you're safer to let these

mats clear about 1/16".) Mats lying flat on the partitions usually indicate too little clearance.)

Partitions Get Worn Out

LOOMIS: A large part of the trouble on many old machines comes from partitions that have been bent so many times they have lost resiliency. These are not too hard to replace. Take out the bar at the lower back of the channel entrance frame; take off the front guard and the wire; tap the partitions up from the bottom, and pull up and out from the top with pliers. New ones will need a little tapping to go in. Don't forget to replace the bar.

Adjustments of the Distributor

HARDING and LOOMIS: These adjustments are similar on all types of machines, and so will be treated together.

To Adjust the Distributor Beam

Linotypes since Model 5 have an lateral adjusting screw at the top of the beam, on the right front. With a 7/8" socket loosen the two bolts that hold the beam; move the beam the required amount; tighten the bolts; set the adjusting screw against the beam.

On old Linotypes — probably where the distributor bars become worn — it becomes difficult to move the beam far enough to the right (to your left as you are working on it) for the mats to clear the partitions. In this case you can take the bolts to a machine shop and have them altered. Starting just under the head, turn the shaft of the bolt to 7/16" for a distance of 2⅝". This will allow plenty of adjustment and also plenty of holding power — but don't lean on that 7/8" socket wrench.

The beam adjustment is made on the Intertype by two adjusting screws just above and in front of the distributor box; they bear on the frame. In adjusting, leave one tight; loosen the other and move the beam; then if you want to move it back, you have the original adjustment preserved.

Vertical Space Between Bottoms of Mats and Tops of Partitions

On old Linotypes and most Intertypes the space should be 1/16". On Intertypes having fast screws, this dimension is usually reduced; on Linotype fast screws, it is only 3 points. If too close, it causes mats to fall all over.

Old Intertype and Linotype magazines and cradles are adjusted to raise or lower the channel entrance by two screws that rest on the cradle supporting rod under the cradle.

On newer machines the adjustment is made in the beam by a screw at each end, in the top.

Lateral Adjustment of Intertype Channel Entrance

This is done by thin washers, a pin and set screw, or an adjusting screw in the channel entrance frame near the distributor box, but this adjustment is usually reserved to bring alignment of the partitions with the magazine partitions.

Space Between Channel Entrance and Magazine

All channel entrances bank against a screw at each end, which should be set to provide 1/32" between the channel entrance and the magazine.

Alignment af Flaar af Channel Entrance With Flaar af Magazine

The channel entrance should be slightly higher. The Intertype channel entrance is self-aligning. Older Linotypes have eccentric pins at the ends for this. Newer Linotype magazine cradles have locating cradle blocks which are doweled at the factory and need not be changed.

The Mat Guard

This should be set, by cautious bending of the brackets, so the guard will miss the mats by about .005" its entire length. If the long strip is bent, get a new one. The brackets can usually be bent with ease by tapping at the middle of the curve with a small hammer, or bent back up by prying with a screwdriver against the upper screw while it is protected by a linecasting slug.

Undoubtedly it is possible to bend the ends of the screw at this, but I have never done it.

The Spiral Autamatic Distributar

HARDING: In 1909 the Mergenthaler Company brought out the spiral automatic distributor, a rather ingenious device which nevertheless is not complicated when it is understood. There is no stopping bar. The partitions are fixed, not flexible. When the bottom screw is retarded by a mat, the screws are thrown out of time and stopped.

Adjusting the Mat Guard an the Spiral Autamatic

LOOMIS: The mat guard is set differently here. First, oil the two bearings through which runs the round rod that carries the mat guard. See that the spring that pulls it into place is functioning positively. Now the usual adjustment is made by bending the small cross-piece at the top end of the Distributor Screw Guard Lever (G-2084), which bears against the mat guard. Usually this lever is brass, but it is only a couple of years since I ran into one that was coppered on the

outside but cast iron on the inside. . . . We have some very good welders these days.

If yours is cast iron, the safest deal is to wrap a 1-point or 2-point lead around the screw that actuates the lever. For a permanent job, you can get a dab of metal welded on the screw and then grind it down.

Hooking the Spirol Automatic Spring

LOOMIS: Inside the spiral automatic clutch there is a free-floating gear, T-49, which impels the screw itself through a spring, G-1527 for a Model 8, G-3405 for a Model 14. (The spring for the 14 is heavier.) Occasionally this spring breaks a loop and falls off, and you cannot start the distributor to save your neck. If you look around on the floor you may find the spring. If not, dig out that case of 10-point and hunt up the bellows to blow the dust off.

But let's suppose you have the spring. Hook one end of it over the uppermost hook (you'll need a light), then turn the clutch a little. Loop a string through the hook on the free end of the spring. Now you can hook that end of the spring over the other hook, and away you go. (Some like to make a hook on the end of a paper clip, and use that. It is more maneuverable.)

The free gear must be free on the end of the screw at all times. If it is not, you will tear up some partitions.

The Clutch Stretches the Clutch Springs

LOOMIS: These two larger springs are easily gotten at. About the only trouble is that if the clutch leather sticks too hard to the clutch pulley, the springs will be stretched beyond recognition. Later models fixed this by tapping a hole in the flange, about ½" behind the small blocks, and putting in a screw so they cannot possibly go farther apart than that. Keep these blocks tight and keep a little hard oil on them. Here too a heavier spring is made for the Model 14, but it is not always on the machine.

Adjust the Spring Collar

LOOMIS: This is movable. Set it so that it stretches the springs about ½" when the blocks are together.

To Oil the Clutch

HARDING: Besides the obvious oil holes, there are two that require attention: one in the clutch pulley, under the belt (you have to remove a screw), and one in the clutch pulley washer flange (you find this one by separating the pulley washer flange from the clutch spring collar).

Why Doesn't the Distributar Stop When Yau Pull Dawn the Gate?

LOOMIS: It should, you know. There may be several reasons:

Spring gone from behind the distributor clutch lever; those with weighted U's often have to have springs anyway, though they aren't supposed to.

Distributor Clutch Lever Screw worn down.

Distributor Clutch Flange Collar (G-1061) may be set too far toward the distributor box. Generally it works best on the edge next to the cast iron bracket.

Occasionally a clutch leather seems to be reluctant to turn loose. Spread the flange away from the pulley and drop in a pinch of graphite.

Mats Strike Channel Entrance Partitians

LOOMIS: As suggested, this may be for lack of adjustment of the distributor beam sidewise, or worn distributor bar.

Daes Leveling Affect Distributian?

LOOMIS: Absolutely. In fact, you take a machine where you can't seem to get a sidewise adjustment that will help, and you start experimenting a little with about 6 points at a time under the right legs or under the left legs. Quite often you can get it perfect this way.

Leveling is determined by setting a level on the long shaft to which is attached the back distributor screw. Usually we set the right end (the distributor clutch end) a little high for better distribution.

Mats Jiggle an Distributor Bar

LOOMIS: This too can be fixed. If leveling or raising the outer end a little doesn't do it, you may need to re-time the screws so as to advance the lower screw, which will carry the mat at a slant, bottom end forward. Therefore it is not free to jiggle. Most distributors are now made this way. In any event, on old style distributors or on spiral automatics or on Intertypes, advance the bottom screw two or three teeth. If there are pins in the gears, you will have to remove them by sawing them down the middle and bending out the remainder. This is a very common practice — advancing the lower screw — and a very sound one. The beam will have to be re-set now.

But sometimes the mats will still jiggle, and sometimes there are inexplicable distributor stops in which a mat — only one — stops as if it had hit the partition. Maybe it has. On an old distributor bar you may find either unusually worn combinations or small burrs at the ends of combinations. Either of these may cause an occasional mat to fall crooked. It is rather hard to put your finger on, especially if the defects are on the front side of the bar. Get a dentist's mirror and raise the back screw and you can manipulate the light so that you can get a

good look. If there is trouble from unusual wear, you will have to get a new bar. If there are burrs, you can eliminate most of the trouble by filing them off very carefully. You will have to remove the bar for this job. Jiggling also is caused by burrs or nicks in the distributor screws.

Letters Drop Several Chonnels Lote

LOOMIS: If this happens repeatedly on the same letters, it probably comes from too close a setting of the mat guard, which presses against the mat as it reaches its own channel and holds it on the bar until the mat has passed.

Mats Fly out on Floor

QUESTION: We are having an awful time with mats flying out of the distributor box to the floor. We'll get a dozen a day like that. — D.A.T., Holdenville, Okla.

HARDING in the *Graphic Arts Monthly:* It rather sounds to me as if your distributor box rails — one or both — are bent together so as to bind the mats. Then when they are released they might jump, and the first one or two might go past their channels. Watch the mats as they come out of the box. There should be no perceptible movement in connection with leaving the box rails.

Matrices Twist on Distributor Bar

QUESTION: We have quite a number of mats getting twisted on the distributor bar. Can you suggest a remedy? — T.R.S., Clarksburg, Tenn.

HARDING in the *Graphic Arts Monthly*: This sounds as if the mats are not coming out of the box right. See that the distributor box rails are spaced correctly apart (.003″ on each side of a mat), level, at the right height (see *Adjustment of the Distributor Box,* page 239). If the same mats, you probably have some damaged combinations by now. Matrix toes reduced by wear as much as .020″ will cause this too.

Trouble With 14-Point

QUESTION: We are using a font of 14-point Cheltenham Bold, and we have trouble. If we get some mats to go into the magazine, others won't. I am about to give up. — W.Y.H., Wausau, Wis.

LOOMIS: A heavy 14-point will always give trouble, although it can be made to run pretty well. These are big mats, and you may have to bend the fixed partitions a little to accommodate some of them. Then it often happens that the entrance channel is not parallel with the magazine (this, of course, on either end, for the channel entrances are straight, while the magazine is wedge-shaped. A very full mat will have trouble making the curve. Although the toes will follow the track, the body of the mat is stopped by the partition. Sometimes it is necessary to put a belly in those partitions to allow such mats to go through.

Too Mony Mats in Channel Will Couse Stops

HARDING: This is one of the most mysterious of all. If you get more than 21 mats in a channel, you will have stops at the entrance of the magazine.

Troublesome Distributor Stops

E. M. KEATING in *The Inland Printer:* An Illinois m-o says he had sixty-eight stops on one of his three machines in one day. New mats and old work alike. The drive wheels are running 74 r.p.m. and there is some vibration of the machines.

On machines of this age, the speed should be cut down to 68 r.p.m. The floor appears unstable, and the only thing to cure it is a cement foundation. Determine if the machines are level; raise the keyboard side a little. Remove all defective or damaged mats, of which you will have a number by this time.

By this time, too, a lot of your thin mats will have bent toes and ears from the many distributor stops, wherein mats are sometimes dragged along by a too-strong distributor clutch. The thin mats being bent can cause a great many stops.

Sometimes the land at the entrance of the floor of the magazine, having been battered over by several thousand mats in the last thirty years, becomes an obstacle. A mat will hit it and pause, but by that time another one comes alongside, and you have a stop.

Bent thin mats can be caused by the fact that thin mats are lifted two at a time.

Burrs on the toes of certain letters, especially hyphens, usually indicate tight lines.

Auxiliory Trouble

If you are using large mats in a 28-channel auxiliary, it may take some maneuvering to make them distribute. Shift the distributor beam back and forth a little at a time until they seem to hit right. Changing the level of the machine will affect this adjustment much more than you might imagine. In fact, you can adjust the dropping-point of the mats with a few leads under the legs of the machine.

CHAPTER XXIX

MAIN CAMS AND DRIVE
STARTING AND STOPPING
MISCELLANEOUS

Do You Run the Main Coms Dry?

LOOMIS: In the year 1560 one of my ancestors was burned at the stake for heresy, so I come by it honestly. No, I absolutely do not run the main cams dry. Once the outer surface of a cam is worn off, the cam wears down in a hurry. Some use kerosene on the cams; I use plain oil. Nowadays some cams are coming equipped with felt oil wipers. The thing is: be sure the cam rolls are turning. If one is not, get a new roll and pin. Then you can oil away all you please, and your cams will never wear out.

Storting ond Stopping Adjustments

LOOMIS: Both stopping and safety pawls should be 15/16" from the edge of the cam.

The vertical stopping lever should be ¼" under the pawls; set by the square-head screw in top of vertical lever.

Vertical starting lug to stand 1/64" back from the pawls; set by a square-head adjusting bolt inside the column.

Vertical starting lug to push the pawls 1/16" off of the stopping pawl; stroke limited by large headless screw in top of vertical lever bracket.

Stopping pawl to be pushed off 1/16" by line delivery; adjusted by turning the plate on the stopping pawl in or out. Watch this one; the plate is cast iron and will break; the adjusting screw should not be turned out until the holding screw is loosened.

Safety pawl to stop when pushed off 1/16" (not on old machines).

1/32" between eccentric screw at back end of long rod and the vertical lever lug. Machine "in action." This eccentric screw is under the metal pot.

15/32" between flange collar and machine bearing (this is the famous clutch adjustment, just inside the frame of the machine); machine "in action." Determined by the clutch packing. The clutch rod should not have elongated holes;

the clutch leathers should be .125" thick; it's your baby from there on. Keep the leathers clean; rough them up when you have the clutch out; keep the brass screws below the surface of the leathers. The new adjustable clutch rods save a lot of work.

1/32" between lower stopping lever and forked lever; machine "in action." This adjustment is subject to considerable variation; I would say it is about right when a grown man can just about stop the machine by pushing down on the first elevator as it goes up. This is Nemo Wraggett's test. Set by the screw in the upper stopping lever.

Clutch Slips and Assembler Slows Down

If the assembler slows down when the clutch slips, it is not a clutch slip but a driving defect. The motor is slowing down or the drive belt is slipping.

Bounce of Coms ot Stopping Point

LOOMIS: A couple of years ago Milton Anderson pointed out something I had not seen in all my time around machines: that the main cams, in coming to a stop, normally "bounce back" a little. This I think is caused by the clutch spring acting through the forked lever. If your machine does not bounce back, something is binding. In our case it was a cam roll that turned hard. The main cams came up to a dead stop and gave it away.

Whot Mokes the Mochine Jerk or Bocklosh As It Turns Over?

HARDING: This is a worn drive shaft pinion. They are not too difficult to install.

LOOMIS: We-e-ll, now, that depends. Getting the old one out can be a chore. Use plenty of penetrating oil. Stick the end of a brass rod between the drive pinion and the drive gear. (Of course you have knocked the pin out.) Take off the clutch pulley. Put the clutch back on, and use it to twist and pull. I recall one sad day when one of those pinions had to be sawed off — and that isn't funny when you're flat on your back.

Once having gotten the old one out, try the new one in the shaft to be sure it's going to go.

You'll need a special taper reamer from the Company to ream the two holes together if you expect the taper pin to stay in. Set it with the clutch crosswise. Then the screws in the clutch and the big ends of the taper pins will be up when the machine is at normal.

Cams Keep Coosting When Clutch Is Shut Off

HARDING: A gummy, sticky, or overpacked clutch will do this.

Why Won't the Mochine Stort?

LOOMIS: Probably maladjustment of the stopping pawl; the line delivery cam roll doesn't push the stopping pawl off of the vertical lever.

This also can happen when the outer screw of the clutch works out.

Why Daes the Machine Keep Going After the Slug Is Delivered?

HARDING in the *Graphic Arts Monthly:* Clean the clutch leathers. See that the drive pulley is free on the shaft. But most of all, see that the automatic stopping pawl is working freely, that it is not pushed out by the upper lug of the starting and stopping lever, that it comes to rest on the stopping lever, that the stopping lever is not rounded and covered with oil. The clutch lever itself (in front) may be loaded with metal chips or it may have a dry, gummy wingpin. I have even seen the ninth and tenth cams come loose and cause this.

If this develops suddenly, look for a disconnected line delivery link just behind the face plate.

Do You Need a Brake on the Drive Shaft to Eliminote Excessive Rebound?

LOOMIS: No. Most likely a clean clutch, properly adjusted as told above, will stop this.

What About Monamelts?

HARDING and LOOMIS: The Monomelt is a good piece of equipment for any sbop. It saves re-melting and allows lower temperature in the lower pot.

Linotype Border Block on an Intertype

HARDING: If a Linotype border block is to be used in an Intertype, the under side of the block should be tapped ½" from the right end, and a ¼" screw inserted to project about half an inch. This will hold down the justification lever and permit the cast. Eliminate use of other pin.

Slugs Stick to Border Slide

Both DOANE WOOD of Sioux Falls, S. D., and H. B. ROYCE of Reno, Nev., say they have found border slides, usually plain ones, where the brass below the actual face was swelled over a little, "pinching" the slug and either pulling it out of the mold entirely or, more often, just a little before it broke loose, which resulted in slugs of varying heights. They say these can be fixed by carefully breaking the corners of the brass slide with a fine file.

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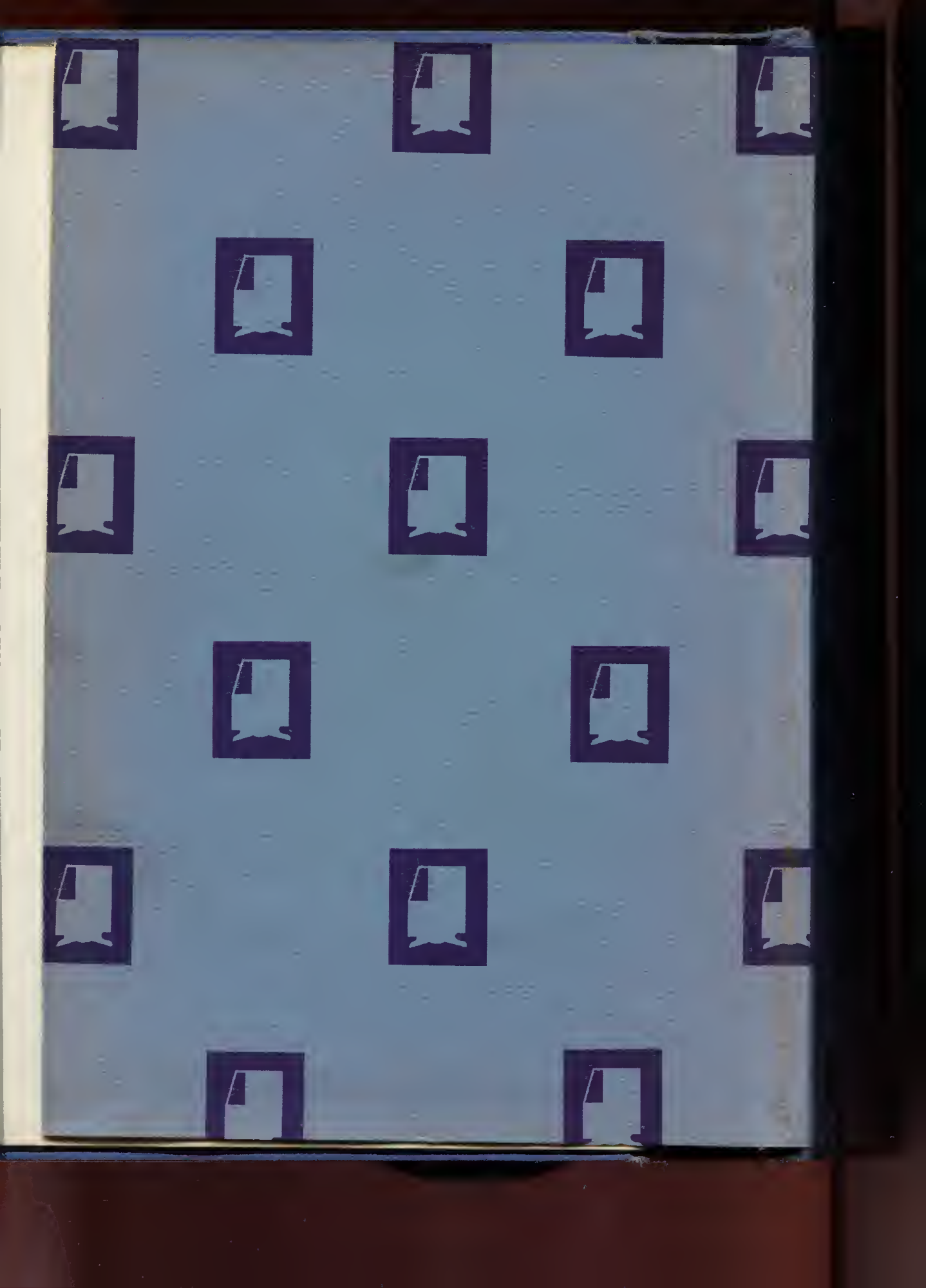

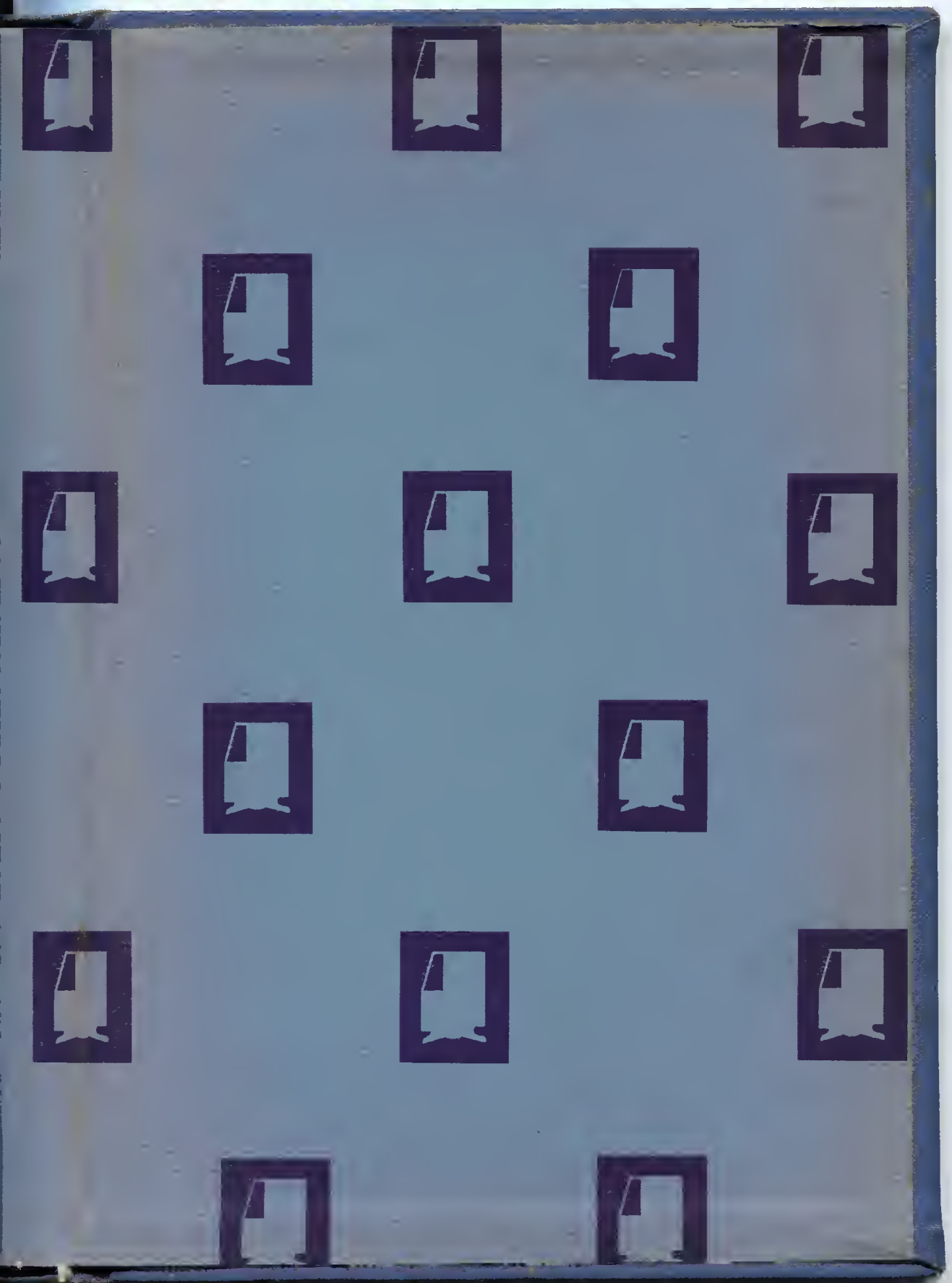

DIECASTING OPERATOR-MACHINIST

About the Authors

Edwin B. Harding, known as "Dean of Printing" taught for thirty-three years at South Dakota State College. He retired from the school as assistant professor of printing and rural journalism. He taught nearly 600 students the fundamentals of Linotype keyboard composition and Linotype mechanics. Before going to South Dakota he worked in many shops throughout the middle west as operator, machinist and foreman. In 1938 he wrote and had published a widely used training book "A Practical Touch System for the Linotype," now in its third edition. For the past seventeen years he has edited a column in the Graphic Arts monthly entitled "Linecasting Machine Questions." He also contributed many articles on linecasting problems to various printing trade magazines.

Noel M. Loomis, a wage-earning operator at the age of ten years, has worked in many shops and under all conditions. He is peculiarly known along publishers row as the only free lance writer who submits his manuscripts on galley form, set on his linotype machine. This machine is in his home and is used for his own story writing. For years Noel Loomis has wanted to share his hard-won knowledge and experience with his fellow craftsmen. His correspondence with Edwin B. Harding resulted in this collaboration.

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